

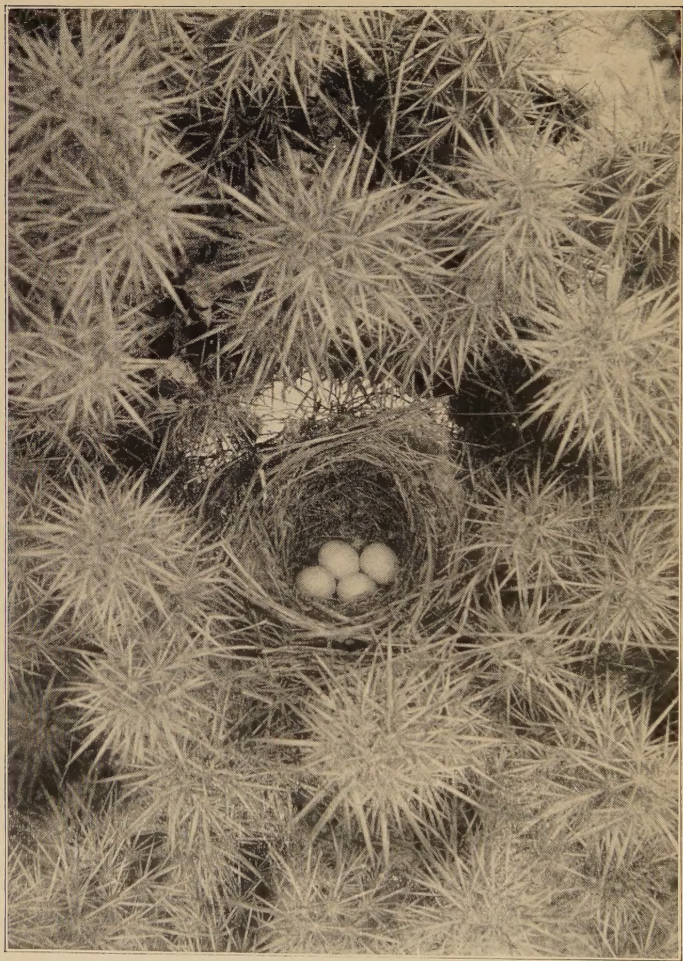
EDMUND C. JAEGER

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DENIZENS OF THE DESERT



NEST OF THE BLACK-THROATED SPARROW IN CACTUS

Denizens of the Desert

*A book of Southwestern mammals,
birds, and reptiles*

By

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Author of "The Mountain Trees of Southern California"*

WITH ILLUSTRATIONS



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TO
DAVID DANIELS KECK
WHO SOUGHT OUT THE TRAILS WITH ME
AND WHOSE COMPANIONSHIP
AND SYMPATHETIC INTEREST IN NATURE
HAS BEEN A CONSTANT HELP
AND INCENTIVE

PREFACE

FOR the past ten years the writer has been an almost continual saunterer over mountain and desert trails — a constant searcher of the wild places of nature that he might know intimately the green growing things and learn more of the life-histories of the animals, birds, and insects that dwell in the unfrequented and secluded domains of the wild. It is with a desire to share the pleasures derived from his observations and studies that he sends forth these sketches of the lives of the denizens of our Southwestern deserts.

The peculiar physical and meteorological conditions which have made the North American deserts have likewise had their influence upon the animals that came to inhabit them. The environmental forces have in many ways so much modified their bodies and their behavior that they are recognized as being extraordinarily unique among animals, and the desert fauna stands out as among the most distinct of the

minor life-areas of the world. Since the stories of the lives of few of them have ever been presented in popular form and untechnical language, readers will find here set forth much new and interesting information.

In some instances a didactic style of presentation has been chosen. This has made it possible to give much valuable information that could not have been included had the effort always been made to write a "good story." Writers on natural-history subjects have, in their desire to create interest and to bring their story to a fitting climax, frequently conveyed impressions concerning the behavior of animals which were false or misleading.

The information concerning these birds and animals has been gained in large part by observations in the field without trap or gun; for it has been recognized that it is possible to obtain true ideas concerning living creatures only through sympathetic and friendly interest in their habits and behavior under natural conditions.

Rather than attempt to give the life-histories of all of the many animal forms inhabiting the

desert region and burden the reader with many repetitions, the writer has chosen typical species from among the most interesting, noticeable, and predominant orders, and has thus hoped to give a broad view of the life of the region under consideration.

Thanks are expressed to Mr. Robert Anderson, of the Riverside Junior College, and Mr. J. C. Odell, of Occidental College, for their kindly criticism; also to Mr. Wright M. Pierce, Mr. Edwin Avery Field, and others for their aid in furnishing many of the illustrations.

The writer recognizes the help he has gained from the reading of the technical papers of specialists of animal ecology, and if in certain instances he has seemed to have drawn freely from their works, it is because he desires to bring to the reader the contribution they have made toward a fuller knowledge of the life-histories of the animals considered. The writings of Dr. Joseph Grinnell, Dr. Harold C. Bryant, Dr. Edgar Alexander Mearns, Dr. J. Van Denburgh, and Mr. Frank Stephens have been specially consulted. Thanks are also due to Messrs. G. P. Putnam's Sons for permission to quote

a part of a tale entitled "The Coyote and the Beetle," from *Zuñi Folk-Tales*, by Frank Hamilton Cushing. Much of the matter included in the chapter on the California road-runner originally appeared in the pages of *Saint Nicholas*.

EDMUND C. JAEGER

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DENIZENS OF THE DESERT

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THE CALIFORNIA ROAD-RUNNER

DENIZENS OF THE DESERT

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THE CALIFORNIA ROAD-RUNNER

(*Geococcyx californianus*)

OF all the feathered denizens of the desert there is none that has such an amazing stock of peculiarities or so many odd and interesting combinations of absurd manners to show us as that unique bird, the California road-runner. He is the desert's hermit bird wag, as full of comical manners and as resourceful in mischief as the fun-loving jay or inquisitive nutcracker, yet, unlike these birds, never obtrusive in his familiarity. And how he does love sports! Every morning he goes down on the trail below my shanty and saunters idly along waiting for me to come with my pail for water, well knowing that I will give him chase and afford him the fine fun of beating me to the corner. Just as I am about upon him, he leaps into the brush out of sight and is seen no more for an

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hour or two. This born gamester has been found time and again sportively pursuing the ends of surveyor's chains as they were dragged along by the linemen, or seen on golf grounds running down stray-driven balls with the eagerness of a playful dog.

Byron said of that sagacious and celebrated wit, Richard Sheridan:

Nature formed but one such man
And broke the die in moulding Sheridan.

If we like to phrase it so, we may surely say with equal aptness concerning the road-runner:

Nature formed but one such bird
And broke the die in moulding him.

Yes, he is the one bird you never mistake for any other. The bristle-tipped topknot which he raises and lowers at will, the reptilian-like face with its deep-slit mouth, and the long tail which so unmistakably registers his emotions, make him a bird of most singular appearance.

The road-runner's speckled coat of feathers is a patchwork of varied colors. The feathers of the head and neck are dark steel-blue, of the upper parts of the body, bronzy or coppery



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ROAD-RUNNERS ABOUT ONE-THIRD GROWN

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green, changing to purplish violet and green on the upper middle tail feathers. The outer tail feathers are steel-blue with green and violet reflections. Everywhere, except on the rump, the upper parts are streaked with white or brownish-white, especially the wings — this white and buff marking being produced by an odd fringelike fraying-out of the edges of the feathers. The peculiar bare space around the eye is beautifully marked with blue and orange. The only real somberness about him is the brown, tawny, and white that covers his breast, throat, and sides. Yet so intricately and wonderfully placed are the units in this mosaic of color that the bird appears almost as brown or gray as the earth on which he runs. It is only now and then when you are near to him that you catch the iridescence and regal color splendor of his coat. These color markings are the same for both sexes and it is hard to tell them apart.

This strange cousin of the cuckoo has earned his name from his apparent delight in sprinting along roadways, especially when pursued by horsemen or moderately slow-going vehicles.

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In the picturesque old days of California, when tourists were frequently driven over country roads in tallyho coaches, it was no uncommon sight to see this bird; his way of running a half-mile or so in front of the fast trotting horses was long remembered by the sight-seers who never tired of telling about their introduction to the bird racer. Another common name, "chaparral cock," is given in allusion to his living in the chaparral or scrub forest of the semi-deserts; and he is called "ground cuckoo" because of his inability to leave the ground in long-sustained flight.

Formerly the range of the road-runner included the grassy plains, chaparral-covered hills, and arid mesas from Kansas to the Pacific Ocean, and from Central California to Mexico. With the settlement of the land and the increase in the number of gunmen, this unique bird is rapidly becoming rare, and the familiar Maltese-cross footprints which he leaves along dusty roads are seldom seen any more except in the wildest portions of his former range.

The road-runner makes no regular migrations and is seldom seen except when he is alone.

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Only twice have I observed him in company with his mate. Sort of a Bedouin is he, a thorough son of the desert, and impatient of the restraints of communal life. The accusation of being a vagabond like the shiftless coyote can never be brought against him. On the desert the road-runner exhibits a marked preference for mesquite thickets. He fully realizes what excellent protection the thorny, low-growing trees offer, and once he chooses a clump of mesquites for his "stamping grounds," he seldom leaves the vicinity and may be found there year after year.

Like a policeman the road-runner apparently has his beats, and any one who watches him day after day will be surprised to note how regular and punctual he is in passing certain points at definite times. An invalid on the Colorado Desert recently called my attention to the fact that a road-runner passed her porch regularly at 12.25 o'clock every day for over a week, never varying by more than a minute or two. A gentleman, who some months ago put up a new board fence, tells me that a road-runner now amuses himself almost daily by jumping up on

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the upper rail and running at top speed the full length of one side of the fence. The peculiar thing about it is that he invariably does it at the same time of the day — just about noon.

Persons who have tried to make a pet of the “pasiano,” as the Mexicans like to call this lanky, ludicrous-feathered wit, find him so mischievous that he often proves himself a source of endless annoyance. A Mr. Dresser, of Matamoros, referred to by Dr. Ridgway, who had one partially domesticated, found he could not let it remain in the house at all. “It would hide and steal everything it could carry off and was particularly fond of tearing up letters and upsetting the inkstand. It was never caged or tied up and would frequently pay the neighbors a visit, always returning before evening. The bird had a singular antipathy to a tame parrot, and whenever the latter was let out of the cage, it would get into a rage, and either go to the housetop or decamp to the neighbors.”

In spite of his prankish, sportive nature, the Mexicans look upon the road-runner as a purveyor of good luck and a very desirable neighbor, and he is not unwelcome when he comes,

as he often does after getting acquainted, into the yard to share a bit of grain with the barn fowls.

Last night I threw out a whole panful of "left-overs" to the birds and antelope chipmunks. This morning almost before daylight there were signs of trouble in the yard. When I went out to see what was up, I found Betsy Bounce, the rock wren, and half a dozen of her feathered kindred sitting around on rocks close by, vigorously scolding and uttering notes of protest while they saw the morsels they so much wanted gobbled up by a road-runner. Playing the bully, he had stationed himself in the center of the supply, and was paying no more attention to their rounds of scolding than to their nervous fidgetings. Only when he had picked up every crumb did he desist eating. Then with an indifferent air he ran down the trail, mounted his favorite perch — an old mesquite hitching-post — and began puffing out his feathers.

The pasiano's appetite is as queer as his looks. He eats everything you would not expect a bird to eat. Seemingly bent on testing the edibility

of everything that runs or crawls, he swallows horned toads, grasshoppers, mice, centipedes, millipedes, cutworms, spiders, bumblebees, and occasionally even snakes, wood rats, and newborn rabbits. Cactus fruits and the berries of the sumac are among his vegetable foods. This bird has a penchant for meat, and his flesh-eating habits sometimes get the better of him — for instance, when he finds the meat set as bait in traps. Too often the trapper, making his “rounds” in the morning, finds the feathers of some ill-fated road-runner which was caught by the steel jaws and in turn eaten up by some coyote or fox that found him fluttering helplessly in the trap.

The road-runner has extraordinary ability as a stalker of rapid-flying insects. This is attested by the fact that in the stomach of a road-runner taken near San Diego, California, thirty-six cicadas were found — insects which the entomologist always finds very difficult to take on the wing.¹ Again and again I have seen him leap in air and snap up some great

¹ *University of California Publications in Zoölogy*, vol. 17, No. 5.

grasshopper that was desperately winging his way to safety. Always after the bird caught his prey, it has been amusing to me to see him standing in proud pose gazing into blank space and, with a soliloquizing air, losing himself in self-complimentary contemplations over his victory. In the meanwhile his long tail was generally moving delicately up and down like the balance-arm of a scale.

Lizards are the pasiano's chief fare; these he cleverly picks off the rocks and one whack of his bill is sufficient to kill them. So fond is this bird of lizards that he has received the common name of "lizard-eater." Especially during the nesting season are many reptiles taken. The baby birds are almost raised on them. Dr. Harold Bryant ranks the road-runner as one of the worst natural enemies to which lizards and snakes are exposed.

Early in May I saw a funny sight, when, with a whirl of wings, a road-runner sprang down upon an ill-starred lizard and almost literally pinned him to the sand as he stuck him with his bill. As is usual the lizard disjointed and surrendered his tail in the onset. The road-runner

picked up the lizard's body and would have picked up the dismembered tail also, but he was at a loss to know how to do it. How could he, when his jaws were already pried wide apart by the reptile's body, pick up in addition the wriggling, squirming tail? — that was the question. He looked at it puzzlingly and with curiosity, and tried again and again to pick it up without putting down the rest of his prize. He seemed to be suspicious that the tailless reptile once down might run away while the cast-off appendage was being picked up. He would run no risk. In some manner the body of the lizard must be adequately compressed between the jaws to bring the ends of the mandibles sufficiently close together to hold, in addition to the body, the delectable but recalcitrant tail. And so several times the mandibles were firmly pressed together until the lizard's bones were well cracked. The obstreperous tail was then picked up and the bird, holding his head high in air, ran off with his wriggling prize, under a mesquite tree, over the rocks and into the brush.

It is not often that you run across the nest

of this curious dweller of the deserts, and I was filled with emotion when a few days later I was led to the nest and found the mother sitting on a pile of sticks, the ill-made home placed some seven feet above ground in a juniper shrub. With her mottled and speckled plumage she was so very inconspicuous that I am sure I should never have seen her had she not jumped off the nest as I approached within a few feet of it.

What interested me as the days went by was not so much the rude home, lined with almost everything from a snake skin to bits of manure, or the yellowish egg within it, but the patient mother, who sat almost seven weeks on the nest, first with the eggs and then with the young. The period of incubation was not unusually long nor were the birdlings slow of growth that the mother bird had to stay on the nest so long. It was her strange method of hatching her eggs. As though she dreaded the ordeals incident to caring for a whole brood of awkward, gawky, gluttonous, clamoring youngsters of the same age at once, the eggs were laid at considerable intervals and the incubation began as soon as the first was laid. Thus the

first of the brood was all ready to leave the nest when the last ungainly birdlings were breaking from the shell.¹ How many insects, centipedes, and lizards disappeared down the throats of those lusty youngsters is hard even to imagine; for they were always dreadfully hungry and often fed.

If a female road-runner is approached when on the nest, she generally remains quiet until the intruder is right upon her; then she slips over the back of the nest and flies a short distance to safety, but where she can still see the unwelcome caller. At times she has been known to permit herself to be caught rather than forsake her young.

A member of the Cooper Ornithological Club (Mr. J. R. Pemberton) gives a most interesting report concerning the actions of a female road-runner whose nest he found some ten feet above ground in a sycamore tree. As the observer began climbing up to the nest, the bird hopped to the ground.

¹ Further observations of nesting road-runners has convinced me that this procedure is not always followed, but that the habit is peculiar to the individual. Often incubation is delayed until all or most of the set of eggs is laid.

"Immediately," says Mr. Pemberton, "it began to squirm, scramble, and drag itself away across an open space and in full view. The bird was simulating a broken leg instead of a broken wing! The bird held its wings closed throughout the demonstration, though frequently falling over on its side in its enthusiasm. The whole performance was kept entirely in my view, the bird gradually working away from the tree until it was some thirty-five feet distant, when it immediately ran back to the base of the tree and repeated the whole show. I had been so interested up to now that I had failed to examine the nest, which, when looked into, contained five young probably a week old. When I got to the ground the bird continued its 'stunt' rather more frantically than before, and in order to encourage the bird I followed, and was pleased to see it remain highly consistent until I was decoyed to a point well outside the grove. Here the bird ran suddenly away at full speed and in a direction still away from the nest."

There are many versions of the story which points out the chaparral cock as a killer of

rattlesnakes and the number grows as the tale is peddled from mouth to mouth of imaginative story-tellers. There is always the rattlesnake who was caught asleep and surrounded by a circlet of cholla cactus joints by a clever road-runner. The rattlesnake wakes up and, realizing that he cannot escape, bites himself and dies. Many frills and variations are put in to make the story appear real. When you ask the narrator if he witnessed the incident himself, he always says he knows it is true, but "somebody else told me."

"This," says Major Bendire, "is a very plausible story, and while I am only too well aware of the spines of the cholla cactus, I know that such a hedge proves no barrier to these snakes and that they do not mind such obstructions in the least, passing over without touching them. I consider the story on a par with the generally accepted belief of hunters and frontiersmen in the West, that rattlesnakes will not cross over horsehair ropes when laid around one's bed when camping out. I was a firm believer in the statement, and made use of this snake protector for a number of years; but at

last my faith was rudely shattered by seeing a medium-sized rattlesnake deliberately crawling over such a rope which I had stretched around my tent. The snake paid no attention to the hair rope, but slightly curved its body where about to come in contact with it, gliding over without touching it, and, finding a sunny spot at the side of the tent, coiled up to take a rest, part of its body lying directly on the rope. Since witnessing the performance I have naturally lost faith in the belief and have wished many times since that it had not been so rudely shaken, especially in sections of the country where these reptiles are abundant and where one is liable to find his blanket occupied by one or more rattlers."

In winter as soon as the morning sun is out, the road-runner may often be seen seeking the rocky prominences. Hunting out some well-sunned boulder, he turns his back toward the rising sun and opens up and ruffles his feathers in such a way that he catches every warm ray and allows it to penetrate to the very skin. He then presents a most unusual appearance, looking more like a mammal than a bird. His like-

ness to an animal is produced in large part by the long down-hanging tail and the full exposure of the numerous soft down-like barbs at the bases of the feathers which in their fluffiness look like thick fur. Of all times this is the best to see a road-runner at close range. Purposely now he seems to ignore your presence. Unwilling that you should disturb him in his seeking of comforts, he permits you to approach until you can see the white ring of his eye. Several times I have at such times quietly crept up on one and watched him for ten minutes at a time preening his feathers, running his bill through them and gaping and stretching his long black jaws.

There are three things in which the road-runner's poverty is great — his sense of smell, his power of flight, his power of song. The sense of smell in all birds is so vestigial that at best they can probably smell no better than you can when you have a cold in the head. Even vultures, we are told, must depend wholly on their sense of sight for the detection of carrion and in no degree on their sense of smell as might be thought.

The road-runner relies mostly on his trusty legs for making his escape when pressed by an enemy. He realizes what poor makeshifts of flight organs his wings are, and like the ostrich uses them mostly as aids in running or jumping. It would be a mistake, though, to say that the road-runner never flies in the true sense of the term. Several times I have seen one, when hard-pressed, fly almost an eighth of a mile. I must admit, though, that the act was awkwardly done. If surprised when on rough ground the fleeing road-runner generally spreads his wings and volplanes across the gulleys. If disturbed when on the mountain-side he may glide downward a quarter of a mile to the valley below. It is always a beautiful sight and a feat most interesting to witness.

The pasiano has scarcely a vestige of song, his only emotional utterances being a strange whistling note ("oo — t") ending in a loud clatter, chipper, or crackling noise made by rapidly bringing his mandibles together; and a loud "coo" given most often during the nesting season. The whistle sounds as though the breath were being drawn in when it is produced.

But the "coo" seems to be an explosive utterance.

Many times during the spring days I have been awakened in the morning by this last peculiar song. So loudly and vigorously were the notes "cook — cook — cook" given that I could not help but fancy this almost-human mischief-loving bird calling for me to get up to cook for him his breakfast.

When the road-runner looks at you he almost always gazes at you steadily with one eye, his head being turned sidewise to you. Thus he gets the best possible view of you. The curious thing is, that at the same time he is viewing you, he, with his other eye, may be scrutinizing and recording an image of another object on the other side of him — he watches two fields of possible interest at the same time. Again, if he wills it, he suppresses the vision of one eye, ignores its sensations, and focuses his entire attention on an object of interest before the other. If you will watch him gazing skyward at a hawk, you will see him with his head turned sidewise, one eye turned downward (its vision repressed) and the other upward, its attention

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being given over wholly to watching his avian enemy. The road-runner's vision is a hundred times more acute than ours, especially with respect to moving objects. He sees a thousand things that our blind eyes never register.



THE NEOTOMAS, OR PACK RATS, OF
THE DESERT

THE NEOTOMAS, OR PACK RATS, OF THE DESERT

(*Neotoma intermedia desertorum*)

NOT long ago three prospectors, new to the game, decided to do something that all old prospectors know better than to attempt. They concluded to go partners on living together, each agreeing to pay his proportion of the expenses. They had not known each other long, they were men of different temperaments, and this in itself was sufficient eventually to bring disaffection among them. The "falling-out" would have been postponed, however, much longer had it not been for the part a fourth party now played in the drama.

Within a fortnight after the men had settled in their quarters, small trinkets began to disappear. One man lost a small mirror, another an aluminum comb, and a pair of much-valued cuff-links. Every morning now more small articles were missing or found misplaced, and the men became sullen and began to accuse one another of thievery. They argued, scolded, and

cursed in hot words and threatened each other with blows if this constant stealing was not brought to an end.

Finally, one morning at the end of the week, after they had lost some especially treasured articles, they had what is known as a "genuine fall-out," and each fellow declared in ugly words his intention to shift and live by himself. There was no use trying to get along further together.

Each of the prospectors now began gathering together his belongings ready for his departure, and as they worked there were sullen looks exchanged and grouchy expressions and threats. One of the men, remembering he had left a bridle out under a mesquite tree, went out to get it. Several times before he had noticed a queer pile of sticks and rubbish piled under the tree, but it had never occurred to him that this could be the dwelling-place of any living creature. On this particular morning he paused a minute before it as he took his bridle down from the crotch in which he had lodged it, and noticed something bright, shining among the sticks.

What could this be? He ran his fingers in

among the sticks and picked out the shining article. It was one of his cuff-links! "How on earth did that ever get here?" he said to himself. Could this be the hiding-place where the camp robber was secreting his treasure? He picked up a stick and stirred further into the pile. A great, big-eared rat ran out of the stack. As he stirred up the mass of twigs further and came to the inside of the nest, he found a small box of medicine which he had claimed one of the men had stolen only the night before. What could it all mean! He picked up the box and ran to the shanty and urged the accused to come and see for himself what he had found. The men, who were at the house, were curious and suspicious at first, and all refused to have anything further to say, but finally they decided to go out and see what was up. They even began to delve into the mass of sticks themselves. And every time they turned the pile they found more of the missing treasures. They looked at each other in astonishment and more or less shamefacedly, and then finally ridiculously, as they realized the amazing ludicrousness of the situation. Could it be that

this strange and curious-looking rat that ran from the stack of sticks was the culprit and the maker of all this mischief?

There was yet another mystery that now seemed on the way to being solved. The men had noticed time after time that there were small piles of rubbish, bits of manure, and small sticks here and there in the house, and they had wondered how this useless stuff came there. They would clean it out, but always after a few days there was more of it. They had heard strange noises at night of animals of some kind running around on the sills and on the floor, but they had repeatedly smelled skunks, and they accounted for the noise by the presence of these animals. But now they made the sweeping generalization that if this rat could be the one to accuse of stealing all their trinkets, he might also be the one who was piling up all this rubbish in the corners, on shelves and in the woodbox.

And in this inference they were not wrong, for pack rats are given to this very habit. Any object that is small enough to carry off and which strikes their fancy they pick up and pack

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around until they run across some other article that appeals more to them. The first object is then dropped and the second carried until they reach the nest, or until some silly curiosity prompts them to drop this one and pick up a third. On account of this inclination to pack off things and gather and accumulate them in all sorts of odd places in dwellings and about their nests, there has grown up the belief that they are actually given to bartering, never taking one object without leaving another as "pay." This, however, is not a fact and cannot be verified by experience.

The animals which go under the name of "pack rats" or "trade rats" belong to the genus of rodents known as "neotomas." They are not true rats, and are very unlike the common introduced house rats, both in appearance and in their habits, having none of the repulsive aspects and possessing much more interesting manners. They will not live in habitations infested by the common European house rats. They rank among our most intelligent smaller mammals and make most engaging pets. They are gentle, affectionate, and easy to keep.

The appearance of the neotomas is always such as to arouse our interest. With their big, batlike ears, their super-prominent, big, black eyes, their gentle, rabbit-like faces and sleek coats, they impress themselves upon us as being really beautiful creatures.

The neotomas are confined to the North American continent and are most plentiful in the Southern and Western United States. Dr. Mearns found as many as thirteen species and subspecies along the Mexican boundary alone. With the rattlesnake, the road-runner, and the burro, they find a chief and constant place in the narrative conversation engaged in around miner's camp-fires, and it is surprising that such alert, mischievous, and interesting creatures should have found so little place in Western literature.

According to their environment they differ in their methods of building their nests. Those living in the deserts and scantily treed regions generally select sites beneath rocks or in the vicinity of cactuses or other thorny vegetation where they find some natural protection from the ravages of their natural enemies, the coy-

otes, skunks, rattlesnakes, and badgers. All sorts of ingenious uses of cactus joints and small rocks and sticks are made in forming their nests, and the pack rats' domiciles are always homes full of interest to the inquisitive and observant traveler.

The mountain species and those living in brushy and forested areas are given to making huge stick houses either under or high up among the trees. Sometimes the stacks are four or five feet high and are scattered so thickly in the brush of certain localities in the hill country that they number between twenty and thirty to the acre. These nests represent an enormous amount of labor on the part of the rats. Thousands of sticks, stones, old bones, and other oddities such as empty cartridges and the like, enter into their composition. Sometimes they are composed largely of manure, or, as Dr. Mearns found along the Colorado River, of sticks and coyote melons or gourds. It has always been a marvel to me to know how some of the enormous sticks, bones, and fairly good-sized stones are carried. Recently I found a nest in Superior Valley on the Mohave Desert

with hundreds of stones in it the size of pullet's eggs. It seems quite evident that they could not have been carried in the small mouth, and how could the neotoma carry them in her paws!

A mystery equally hard to solve is found among the desert species that surround their nests with the joints of the Bigelow's cholla cactus. This species of shrublike cactus, or *Opuntia*, has needles so close-set, so impenetrable, and so formidable that it seems no creature could carry the joints in any way, much less let go of them once it had them in its grasp. With the least touch they penetrate the toughest-hided animals and hang on with a tenacity that is most pronounced. Only those who have ever tried to pick up or even touch one of the joints of the Bigelow's cholla know how terrible and how painful the prick of the needles is. Not without good reason the Indians declare that the joints of this cactus jump at you as you come near. The wood rat is the only creature I know of that does not fear to handle them. When we remember that these joints are larger or almost equal in size to her own tender body and that they are given to



TRADE RAT'S HOME IN A ROCK-CREVICE
THE ENTRANCE WELL GUARDED WITH JOINTS OF BIGELOW'S CHOLLA

rolling, it is the more unapparent how she keeps herself from being pierced through and through with dozens of needles, especially about the mouth, breast, and feet. I have seen the cholla joints piled up in stacks or lodged about the entrance of the burrow in such numbers that their total bulk would have filled several barrels. In another instance I noticed cactus joints piled two and three deep over an area of at least forty square feet in front of the burrow. The nest was situated high up on a bank and back under a ledge of rock in such a position that every one of those horrible assemblages of cactus needles had to be carried at least forty feet over steep and uneven rock surfaces, the nearest shrub of cholla being that distance from the nest.

This nest was entered by either of two openings. In order that I may explain the ingenious method that the neotoma used to protect these runways from being entered by an enemy, I have drawn the accompanying map of the space in front of the dwelling. An examination of the figure will show that every approach to the holes is most carefully protected by the

spiny cholla joints, barricades more effectual than barbed-wire entanglements in warding off an enemy. Moreover, between all the runways



GROUND PLAN OF THE TRADE RAT'S NEST

is a mat of the awful cholla material, and, as Hornaday well observes, not the most foolish coyote or skunk is so rash as to jump into that spiny mass or run over the pavement of horrible cholla joints for any rat. So no matter how hard-pressed by the foe, when once the neotoma has reached her fortress she is as safe as if she were a dozen miles beneath the surface of the earth.

You may call this unique utilization of spiny cactus a matter of instinct if you wish, but it seems to me to be a downright work of animal

THE NEOTOMAS, OR PACK RATS 35

intelligence of a high order, and every time I see this home I have greater respect for the little creature that makes it.

Pack rats are largely nocturnal creatures, though occasionally they come out in the daytime to feed. They eat a variety of foods, but the chief fare is the seeds of grasses and composites, and, in the spring, green vegetation. They are not good gnawers in the sense the common rats are, and they seldom molest food or clothing protected in closed boxes or chests. It is the mice that do the mischief there.

The nests of the desert species, which are made under rocks, generally consist only of a network of burrows with several well-protected openings. Those of the mountains, which are of sticks, contain several small compartments, each with a distinctive use. Thus one nest I investigated consisted of several long hallways, or tunnels, a granary wherein were stored seeds and green willow stems, a bedroom, and a special compartment used as a storeroom for excreta, for the wild rats are very cleanly creatures. There were no odors of any kind anywhere about the nest. These stick houses

are almost waterproof and a long season of rains is necessary before they become damp inside. Prospectors and cattlemen often go to these nests to get dry fuel during wet weather.

The Indians are very fond of these animals for food, and if they do not use them now as formerly it is because they are ashamed to eat them, knowing the prejudice of the whites toward rats as food. The animals are captured by setting fire to the mounds of sticks. Even when the nests are fired, the wood rats are as a rule reluctant to leave them and many perish in the flame. One would think that the smoke alone would drive them out.

The Hopi Indians, who call a species common in their region "kee-hua' cahl'-a," account the flesh as one of the greatest delicacies. Physicians of northern Mexico "commonly order broth made from the wood rat for the Indians and peasants whom they are called upon to treat just as our physicians prescribe chicken broth and beef tea." Dr. Mearns tells us that he found many charred bones of this rat in the ancient cave dwellings in the Verde Valley, showing that the neotomas were prob-

ably often used for food by the inhabitants.

The wood rats are preyed upon by coyotes, skunks, kit foxes, and the great horned and rabbit-eared owls by night, and during the day they must fear the attacks of hawks and rattlesnakes. Recently while riding through a rocky gulch I ran onto a wood rat upon whom I showered much pity. She seemed perplexed in her slow movements and was trembling from head to tail-tip. I could not wonder; for there in front of her was an enormous coiled rattlesnake casting a spell over the frightened creature before striking. I gave a violent whoop and threw up my hands and frightened the neotoma off into the brush, but before I could dismount and secure a stone to kill the snake, he had crawled into the brush beyond my reach, following, no doubt, his intended victim.

BILLY BOB-TAIL, THE HERMIT
WOOD RAT

BILLY BOB-TAIL, THE HERMIT WOOD RAT

(*Neotoma intermedia desertorum*)

I

THE wind, that had spent the whole of its energies since sun-up blowing the sand in great sweeps across the oasis desert village, only seemed to redouble its efforts as the sun sank in redness below the western rim of the San Jacintos. It was no night for even the hardened prospector to lie out in his blankets, and I sought the shelter of my little shanty, hoping that, though I must literally chew sand all night (for it sifted into the house through every crack), I should at least be able to keep covers over me. 1

But soon after midnight the wind, that had seemed to know no stopping, dropped, and a stillness, that made itself conspicuous through mere contrast with the wind-furious sound of the early evening, now came on. As I lay there in the quiet, breathing once more the clear, good air, there came a break in the silence.

It was the gnawing of rodent teeth I heard; then strange sounds of rapping, rapping, rapping, almost as regular as the beats of a slow-moving pendulum; then again the gnawing; then more of the mysterious, ghostlike rapping. I pounded the floor, threw a shoe into the corner from which the sound seemingly proceeded, and it stopped, but shortly began again. Three hours this knocking was continued. The noise, which at first only aroused my curiosity, now became nerve racking, impossible to bear. If I could only have known its source and how it was made, the knowledge would have taken off the apprehension accompanying mystery.

A few days later I heard the rapping again behind the closet curtain, and in another instant there stood in full view of me the denizen of the world of mysterious rappings — a gentle-faced neotoma, or hermit wood rat, with great lustrous, super-prominent, jet-black eyes, set like enormous crystal hemispheres of black on the all-knowing, all-wise-looking face. His beautiful batlike ears were as large as quarter dollars, rounded and well set up, indicative of his alert and sprightly manner. His body was

covered with a silky pelage as soft as moleskin, brownish buff on the back, clearer buff on the sides, and with white underparts. His feet, too, were white, and the tail (what was left of it) bicolored, dusky above and whitish below — not ratlike, but covered with soft, short hairs. The mutilated tail was really the only detraction from his good looks.

Like the three blind mice celebrated in the rondo he had had his tail cut off, probably in some scrappy feud with another of his kind, so that only a stubby, funny-looking stump was left. And so I called him my Billy Bob-Tail.

With a queer teetering gait Billy now made his way to the fireplace, took up an orange peel which had been thrown there with other scraps at breakfast-time and proceeded to nibble it, holding it the while up to his mouth with his little short forepaws. Shortly he took up another peel, but this time made off with it, carrying it into the closet and down through a knot-hole under the house. In a minute he was back again and got another, and another, working in all fully a half-hour at his self-appointed task. I now began to realize where all my table

scraps had been going, but it took me two whole years of watching to know how Billy made the queer rapping sounds.

This was the beginning of a series of visits which became more frequent until now my mischievous Billy comes around both day and night to carry off peels or to inspect the contents of my woodbox with his long-whiskered, ever-moving, inquisitive nose. No sleepy head is he; his bump of curiosity, his industrious, provident impulses, are too strongly developed to allow much dozing in slumber.

At one end of my poorly floored shanty is a knot-hole in the floor, to which Billy Bob-Tail has laid claim as his door to the mysterious, dark storehouse of his beneath the house. He spent several days and nights rounding it out so as to let himself pass through with ease; and there was little leaving of his job until it was done. His industry was marvelous. He stayed by his task hours at a time — mostly at night. His workmanlike industry, habitual diligence, and steady attention to the business in hand would have been a shame to many a man I know.

The job complete, Billy now set himself to the task of carrying everything edible in sight down that knot-hole. Of oranges and lemons I use a plenty, and there were always many rinds to engage Billy's attention. The total bulk of peelings which disappeared down that knot-hole must number bushels. I have watched him work for two hours at a time, toiling without any rest, except occasionally, when he stopped to nibble at an orange peel — lunch-hour during work-time.

Now it was in connection with this carting away of fruit peels down that knot-hole that I learned to know that a wood rat thinks, imagines, plans, and invents just like human beings. The guidance of instinct can never account for Billy's actions when he had engineering problems to solve or had questions of mechanics proposed to him.

There were a good many grapefruit peels (Billy liked the bitter things) which were so very large that they would not go easily through the hole. Sometimes, when the clever wood rat could not get them down by pushing, he would sit on his haunches, take the peel in his paws,

and nibble around the edges until it *was small enough*. Or, again, I have seen him clip one right in two and then take each half down separately in the ordinary way by carrying them in his mouth. But he had one trick of getting parings down the hole that required in its execution nothing less than the nicest cunning and real acts of judgment and invention — in other words, mental processes of an order accredited to human beings.

One early, rainy morning I was lying on my cot with my face turned to one side watching my industrious pet, when I saw him bring up to the hole an extra large orange peel. This he tried to put through. It would *not* go down, in spite of his repeated attempts. Billy stopped and pondered. A sudden thought came to him. He dropped his peel beside the hole, went down the hole himself, pushed his head up through it, seized the orange peel, and *pulled* it through. That was invention, the product of reason, imagination, and judgment — and Billy a wood rat too.

I have seen him do more. I have watched him carry a number of edibles of large size — bread

crusts and the like — up to the hole, leave his collection, run out of the door at the other end of the house where he had an entrance beneath it, go under and put his head up through the ever-handy knot-hole, and then pull the whole supply of crusts and what-nots beneath. Why he made the roundabout trips to get beneath the open hole I do not know. Probably in our exact way of thinking it was a waste of energy, not efficient. But there is one thing that impresses me more. Billy showed that he could *carry a thought* and hold his attention uninterruptedly to the task in hand.

More surprising still to me was the help Billy took from my hand when he was put to hard straits to get an extra large orange peel through the knot-hole. Many, many times have I pushed while he pulled. Here was the acceptance of coöperation, a trait befitting human beings again.

Not always did this wood rat work so purposefully. Sometimes his work showed more industry than judgment. There were, it seemed to me, times of “much ado about nothing,” — for instance, when he carried all the little

greasewood sticks out of the fireplace and stacked them up one night in a corner, or when he carried a lot of black, charcoaly ashes off behind the cupboard. I can't see much intelligence there — just the instinct to accumulate keeping him busy.

It is surprising what this instinct to pack off things will induce wood rats to do. I have had them carry off a whole boxful of trinkets, drag my spoons off under rocks, bring into the house quantities of sticks, seeds, and manure, and litter up the house with quantities of paper scraps. A lot of the storing of orange peels was useless endeavor; for Billy has carried away during these two years more orange peels than he and his family could eat in four. Store, store, store; that is the ever-compelling, ever-active, ever-prompting thought of his little busy mind, and the industriously inclined body never tires doing the brain's bidding. These things, to which his provident nature directs his activities, are sometimes carried great distances to be stored. An informant tells me that during one summer when she was absent from her desert home, some pack rats carried the

entire contents of a box of lump starch — some thirty pounds — from the upstairs to the basement; that others carried grain from the barn over a hundred yards away and deposited it in her writing-desk.

II

SPRINGTIME on the deserts comes with a rush. Seeds sprout; plants grow, blossom, and fruit in a surprisingly short time. The animals, which have been more or less inactive because of lack of food, cold nights and days during winter, now wake to the new activities of harvesting food and raising the young. Since the season is a short one, they must work with intensity and enterprise.

This is the time when the mice, wood rats, and antelope chipmunks are likely to plunder your bed for wool and feathers to line their nests. I have learned from experience that any precautions you can now take to secure the bed-clothes from their attacks are none too good; for these small rodents now get into everything left open to their ravages. Billy Bob-Tail played "old gooseberry" with my mattress;

and this while I lay in bed. A half-dozen times I was awakened in the night by his tugging at the cotton padding. By pounding on the floor each time I frightened him off, but the fluffy stuff inside the mattress was so incomparably wonderful as bedding for baby pack rats that he just could n't keep away. Never mind, old Billy; two pounds of cotton you owe me and the price of a new mattress, maybe. After this I'll hang my bedding on the clothes line by day, and see that the cot is perched at night high on the rocks far beyond your travels.

My hermit wood rat's mate seldom showed herself, and when she did come around, she was exceedingly shy and retiring. From the nature and extent of Billy's activities I must presume that among these humble rodent folk the males supply most of the material for the nest, and that they take some real interest in the rearing of the young, the number of which is generally three to five.

The home was made under a large rock near the corner of my dwelling where I could carefully watch the activities about the nest. During the early life of the baby neotomas the

mother stayed closely at home. The little creatures kept themselves attached to the nipples of the mother, and, when disturbed, they still maintained their hold and allowed her to drag them about as she ran — always a funny and interesting sight. Mr. A. H. Alver-son of San Bernardino, California, quoted by Stephens in his "Mammals of California," speaking of a family of neotomas he had in captivity, says he noticed that sometimes, when the mother desired to move and free herself from her babies, "she would turn round and round and seem to twist them loose in a pile where they would lie quietly until they felt her return; then they would at once attach to the teats." Speaking further of the young after three weeks, he says: "They were very playful, running about most of the time, but when too venturesome the mother takes them in her mouth and lifts them bodily back to the nest in the corner. Sometimes she lifts them by the neck, but mostly by the middle of the side. After playing and eating, the mother and young make their toilet, the mother doing most of it for them, but the young try to learn; then the young attach to the mammæ and all sleep."

While my pet neotomas were busy at home-making, a third came about the premises, this one a sleek, youthful-looking fellow, but not so tame as my Billy. Animals like human beings are possessed of individuality, and I was anxious to watch the new tenant of my quarters to see what new contributions he would make to my knowledge of wood rats. One morning while I was seated at my table writing I heard a slight noise, and, looking down, saw my new neotoma approaching a crust of bread I had placed under the table for him. What struck me now to do it I do not know, but intuitively I quickly shuffled my feet and sent the wood rat flying with fright across the room. He went down Billy's knot-hole, but soon came out again determined to get the bread. Having plucked up courage he carefully approached the table again. But again I shuffled my feet and he as quickly retreated, went halfway down the hole, and turned back. He now sat still and peered at me from out his big, lustrous eyes, wiggled his whiskers impatiently, and gave a saucy stamp with his hind feet. I could hardly believe my ears. It was the same noise Billy had made

that night of the wind-storm. I shuffled my feet again, and again the neotoma raised the soles of his long-pawed feet and brought them down on the floor with a determined rap.

Oh, what was now my delight! For two whole years I had been guessing, observing, inquiring, and writing letters to scientific institutions and naturalists trying to find out how wood rats did their pounding, and no one seemed to be able to tell me. Now I knew through my own observations. It was the delight accompanying discovery. My new guest had solved the riddle.

This stamping or pounding seems to be an expression of strong emotional states of mind indulged in when angry, impatient, or defiant. Rabbits pound in similar manner under like emotional states. The wood rats and the rabbits strike with the soles of both feet at the same time. Skunks and squirrels, however, who also pound, strike with their forepaws singly.

THE SPINY POCKET MICE

THE SPINY POCKET MICE

(*Perognathus spinatus* Merriam)

SOON after finishing my desert shanty I built an out-of-door cookstove. With cement and small stones I constructed a fire-box and then closed over the top with sheet steel. On the evening when I cooked my first meal upon it the pocket mice were there at the first smell of gravy. They climbed up on the stone border, which was slightly warm, and sat there on their haunches sniffing the odors. So long as I kept perfectly quiet they manifested not the least bit of fear. Evidently they pronounced the supper odors good, for no sooner had I emptied the contents of my skillet than they leaped into the half-warm vessel and made way with the leavings.

These little creatures were so graceful, so clever, so elegant and cleanly, that I never minded having them clean out my vessels. My generous-hearted skunk came only too often to help them at their task. Then, of course,

their labors ended quickly; for these mice knew how skillful are the nimble paws of skunks in catching them, and they hied themselves away into the rock crannies on her first approach.

After this the mice were about in numbers every evening at the approach of darkness. I counted twenty-two about my out-of-doors table at one time. They were everywhere, under the table, on the table, and every other available place. While I sat still watching them they ran up my trouser legs inside and out; they nibbled butter from my knife, and only too often ran across my plate.

They were among the most industrious little creatures I ever saw, rivaling the ants and running them a close second in competition for Solomon's word of commendation. These busy little rodents every night covered every inch of ground about my house in their search for food. Not a crumb was missed, and the thousands of tiny close-set footmarks left in the dust by morning showed the thoroughness with which they searched.

After the evening meal there was always an abundance of crumbs for them and they stuffed

their little cheek pouches almost to bursting, so that these pockets looked like furry balls set on beside the jaws. It was always amusing to see how rapidly the mice worked their little weak forepaws when cramming the cheek pouches full. As soon as a load was secured, they hurried off quickly to the crevices in the rock piles, where they emptied their pouches, and hurried back for more. These mice were especially fond of making off with the burro's barley, and the supply often suffered severely from the work of their industrious hands. A half-dozen pocket mice working all night will carry off several quarts of grain.

On several occasions, while I was absent from my house for a number of nights at a time, they took to storing barley and seeds of various kinds between the blankets and under the pillows of my bed. When upon returning I laid the covers back, I found their little seed piles, each consisting of about a pint of grain. Several successive nights afterward I was awakened by feeling the soft furry creatures crawling under my blankets as they came in with more supplies of grain. Evidently they had not taken

notice of the giant that was now reposing in their storehouse.

Many a merry tune they played at night as they scurried over the tin lids and kettles in the pantry out-of-doors. Sometimes they would make such a racket that I would expect to see everything turned topsy-turvy by morning. But always when I went to count the damage against them I found nothing disturbed at all, a thing which was always a puzzle to me.

For some reason or other the spiny pocket mice much preferred most of the time to stay outside the house, although it had so many cracks through which they could enter and leave. On the whole they seemed to like to stay close to the rock piles out of doors, leaving the indoor crumbs to be picked up by the wood rats and the white-footed mice that seemed to want to come in on every occasion.

It is a clever and swift-flighted owl that catches the spiny pocket mice. I don't think he gets many. A pocket mouse can shoot out of sight and under cover in less time than any wild creature I know of. They leap three and four feet at a single jump, and so quickly that



AN ARROYO OF THE DESERT MOUNTAINS — AN IDEAL ENVIRONMENT FOR SMALL RODENTS

the eye can hardly follow them. They are never about in the daytime, but wait until twilight before venturing forth for food. Thus they avoid many enemies which stalk about during the daytime. But they find in a night-roving species of rattlesnake, the sidewinder, an enemy not to be ignored. This little rattlesnake is so quick in its movements when striking that even the nimble, swift jumping pocket mice seldom escape capture.

The pocket mice are always on the alert and ready for flight when occasion demands. They notice everything. Let me make a sudden movement with my foot, or wiggle even a finger ever so little, and they are off in an instant. It is a singular fact, however, that, though their ear conchs are so well developed for catching sounds, these rodents pay little, if any, attention to noises. As long as they see no motion, they pay no heed to sounds. I have imitated owls at their hooting, carried on conversation with visitors, shouted and whined in sharp tones, and they paid no more attention than if they were stone deaf.

One of the peculiarities of these pocket mice

— and the same may be said of the pocket rats and a number of other small mammals of the desert regions — is their ability to live on almost indefinitely without drinking water or eating moist food of any kind. They are thus unusually well adapted to live in arid places. This ability to subsist without water is the more amazing to us when we consider the large amounts necessary to sustain other higher animal life in the same region. Lieutenant Gail-
lard, of the Mexican Boundary Survey, gives the average amount of water consumed on the desert during the summer by each man of the Survey to be about seven quarts a day and twenty gallons for the pack animals. The desert animals subsisting without water must elaborate all the moisture for their bodies from the food they eat, much of which, especially in summer, is of an extremely dry character, mostly dry seeds. Most of the species of pocket mice are found in the arid Southwest, and none occur east of the Mississippi River. They are very sensitive to cold and moisture and thrive best where the rainfall is least.

The spiny pocket mice are so called because

of the many spiny, somewhat porcupine-like hairs which cover their backs, particularly on the rump and sides. The ears are small compared with the wood rat's, but similarly well set up. Each has at its entrance five tiny stiff black hairs which are doubtless protective in function. The eyes are quite small. The end of the little nose, which is bare of hair, is ever in motion; the shovel-like tip is used as a feeler. The body is little longer than half the length of one's thumb, and when these little fellows are curled up in sleep they are scarcely bigger than a good-sized marble or a walnut. The tail, which is longer than the entire body, is covered with many fine, soft hairs and has at its end a small brush or pencil of hairs, the sight of which would doubtless have delighted the youthful Benjamin West, who as a little boy, you will remember, plucked hair from the cat's tail to make for himself a paintbrush. The pocket mouse's tail would have served the young artist quite as well. The tail is kept well off the ground most of the time, but occasionally you will see marks in the dust showing where it has dragged. When the mice jump, the tail is sud-

denly thrown forward, but as quickly thrown backward when landing.

They are easily trapped, and recently I caught a little fellow in a box trap and for a few days kept him a captive in order that I might more closely observe some of his habits. As soon as he found himself in the cage, he made a careful inspection of it to find an exit. But discovering none, he sat down on his haunches, grabbed his whiskers in his forepaws, and stroked them like an old man in deep thought, and I could imagine him saying to himself: "Now-let-me-see. What am I to do next?" At another time I found him with his tail brought forward beneath his haunches on which he was sitting. All of a sudden he grasped its end with his forepaws and with a very funny motion began running his hands over it, the movement much resembling the reverse of that made by a man when climbing a rope; this over, he cleaned his whiskers and ran off into the corner.

Mice are a humble folk, but a diligent, assiduous people. I have never seen creatures that could work more unremittingly when once

they begin, whether it be at nest-making, food-getting, or seeking egress from a cage in which they find themselves imprisoned. Though nocturnal by nature, they are ever ready to work by day if occasion demands it. How slow, cumbersome, and laborious are the movements of man, how sluggish his disposition, compared with that of these alert, ever-restless, ever-agile, and graceful creatures whom he so often despises!

THE CACTUS WREN

THE CACTUS WREN

(*Heleodytes brunneicapillus*)

THE neotomas are not alone in their use of cactuses as a means of protection; insects, mice, turtle doves, ladder-backed woodpeckers, Palmer and Le Conte thrashers, and several other birds find in the beneficent spiny masses or under the roots a hiding haven or a place to rear their young. How it happens that they can dodge the spears and daggers in which all their foes are likely to be caught, I cannot say, for never were skins or bodies more tender than theirs. Does each have a guiding spirit or have they all been dipped in the river Styx?

Among the most clever of these cactus spine-dodgers is the desert cactus wren, which can perch upon the branches or dive into a tree of the awful Bigelow's cholla with perfect impunity. In fact, the cactus wren finds the company of cactuses so congenial that she not only spends a great deal of her time foraging for insects among their branches, but chooses to

rear her family in a nest embraced and fortified by their needles. I doubt if there is a member of the wren family that better provides for the protection of her home.

Those who are used to associating the word "wren" with the tiny, sprightly, and vivacious bird of the Eastern States, with its happy, jocund, and joyous song, will find it hard to see how the cactus wren can be called a wren at all, for he is such a different fellow from the bird of their acquaintance. On the whole he is rather a coarse-looking bird with no prepossessing characters as to either form or color. Comparatively, he is rather a good-sized bird, having a length of eight inches from bill to tail-tip. The general color-tone is brownish gray with whitish underparts prominently speckled with round and linear black spots, especially on the throat and fore part of the breast. The bill, like that of the rock wrens, is slightly bent. The song is an odd one and hardly musical, consisting generally of only a coarse prolonged clatter or low "chut-chut-chut." It is especially noticeable in the spring during the nesting season. The males are then unusually quarrelsome, hot-tempered,

irascible fellows, pursuing one another in flight over long distances, scolding and giving vent to their peppery tempers and jealousies in shrill, angry, jaylike notes of warning.

These giant wrens are with us all the year, but are seldom heard except during the breeding season. They seem to be less plentiful in winter; food being then scarce they scatter out more. The male and the female stay matched throughout the year and are generally found foraging together. In California they are common in all the desert country as far north as the upper end of Owen's Valley, and on the coast they are found from San Diego to Ventura County. The cactus wrens are also common residents of Texas, New Mexico, Arizona, Nevada, and southern Utah.

The nest presents a very interesting piece of bird architecture. Shaped like a large, long, globular purse, it is laid horizontally (the angle is really slightly less than 45°) between the forks and branches of a cactus, and from it there runs outward a singular covered passage or tunnel, varying from four to twelve inches in length. It is composed of fine grasses and

coarser sticks and is lined with feathers, the whole often topped off with a loose stack of branchlets from certain species of buckwheats growing in the region. I find that the cactus wrens are pretty good botanists and are able to select with remarkable exactness certain species of plants which they desire. In the examination of a great number of nests the past spring in the Colorado Desert of California, I found the lower portion of all the nests consisting of certain plants only, the kind seldom varying from nest to nest, and the top stack in every case made from one certain species of reddish-stemmed buckwheat (*Eriogonum*), and this, though there are growing abundantly in the region several species which might be easily confused. But the cactus wren, bird botanist, never makes a mistake.

There is no need to advertise for information to find out where the cactus wrens have built their nests; for go anywhere you will, you will come upon them among the patches of shrubby cactuses and thorny palo verde trees. And you will find nests in abundance and not judge that the cactus wren population is waning. In a



FLASK-SHAPED NESTS OF CACTUS WREN IN OPUNTIA
CACTUS

walk of about a mile over a cactus-strewn, rocky detritus fan emerging from one of the desert cañons, I once counted thirty nests.

Last spring a nest was made within twenty feet of my door and I had a chance to watch closely the rearing of the young. Incubation began after four salmon-dotted, white eggs had been laid in the nest. When once hatched the baby birds, like all youngsters, grew amazingly fast and their appetites kept the mother constantly afield in search of insects. It seemed only a few days from the time I first saw the tiny, upstretched, gaping mouths until the nest was overflowing with squirming almost full-grown birds. The passageway or vestibule to this nest was very short — not over four inches long — and it was always a wonder to me that none of the restless birdlings became impaled on the frightful cactus needles bristling like bayonets about the edge of the nest. After making inquiry for a number of years, I can find only one instance where young were seen spitted on the thorns outside.

The wrens are peculiar among birds in that among many species there is the habit of build-

ing during the spring or the autumn the so-called "spare nests" or "roosting-nests" which are used during the greater part of the year for sleeping-quarters by the adult birds. Unlike the nests made for rearing the young, these nests are ordinarily small, compact, scantily lined, and built with much less care. In some cases, however, the old brooding-nests are used after being relined and generally reconstructed. During the past autumn I noticed that a cock wren was roosting in a spare nest built in a palo verde tree below my house. During the winter months he quite regularly went to roost at about 4.30 o'clock. On one particular evening in January an incident took place at the nest which was so ludicrous that it needs to be given record.

The wren had nicely settled himself in the nest for the night when a curious, impudent, meddlesome shrike, or butcher bird, flew into the tree, and, bent on plunder, poked his beak into the private residence of the wren. Not pleased with such intrusions, the waspish-tempered wren flew into a rage, and before the shrike was able to realize his precarious situa-

tion he was seized by the foot with a bill-grip as strong as a vise. The captive bird screamed and shrieked, fluttered and pulled, trying to extricate himself from the grip of the wren, who seemed determined never to let go. "You *will* poke your head into places you have no business to, will you?" I could fancy the wren saying. "I will give you a lesson that will last you awhile."

The shrike did finally get away, no doubt glad to have escaped without a toe missing. I feel certain that his pugnacious and curious nature did not lead him to visit those quarters again soon.

The nest of the cactus wren seems unusually well protected from the ravages of enemies common to birds, yet do not think for a moment that these birds are wholly immune from attack. Snakes, those constant terrors of the bird world, even risk climbing up through the ramified and prickly branches of the cholla to get the eggs and young. Since several species of smaller rodents, such as wild mice, wood rats, and antelope chipmunks are also able to climb with comparative ease into the cactuses, it is

really a question whether or not the situation of the nest is any real protection to other than avian enemies.

Not long ago an artist friend of mine, out with his easel and colors, upon hearing a strange bird call, had his attention drawn to a cactus wren which was hovering in peculiar flight above a large cholla. Interested in the unusual actions of the bird, he stepped nearer to observe it, and as he did so he noticed a large red racer coiled among the branches of the cactus, cruelly devouring the nestful of birdlings. As he rushed up to the nest, the snake became frightened and dropped from the shrub, leaving the last little, half-dead bird on the edge of the nest, its mute and bloody remains testifying to the horrible tragedy that had taken place in the once happy bird home.

CATHERPES, THE CAÑON WREN

CATHERPES, THE CAÑON WREN

(*Catherpes mexicanus conspersus*)

OF all our sweet-singing Western birds, it seems to me without a doubt that the cañon wren is the most finished and pleasing musician. All birddom hardly shows a song so full of glad hurry, so sweet and artistically controlled. Whether bursting upon the still, herb-scented air from out a deep-walled cañon, or echoed and reëchoed from the rocky mountain cliffs, it is a song that always arouses the whole soul to rapture. There is first the hurried silvery trill and then the well-modulated descending scale of eight to eleven joyous, liquid notes. It is a song varied at times, but always well worth learning by heart; for by imitating the birds you can induce them to sing again and again, and answer you back from over the cañon depths. It is in the early morning hours before and immediately after sunrise that the song is at its best, most vibrant and clear. As the morning advances, the songs become more infrequent

until during midday we seldom hear a sound from the little throats; but when evening comes again, the notes of the matin song which ceased with the warm hours are again taken up with ardor.

In many ways the cañon wrens and rock wrens are very much alike. They are birds of about the same size, they have similar bobbing motions, and both are rupestrine (rock-dwelling) species, living on similar food. However, the cañon wren possesses little of the friendly curiosity that her inquisitive and polite sister has. Few birds are more shy and retiring than these little sprites of the cañon solitudes. Try as you will you can seldom approach sufficiently near to see them. Just as you think you are upon them they slip away, and after a few moments of silence sing you their scale song from far, far away. And so it happens that most of us must be content to know the sweet singers only by their songs.

However, those who will to know the cañon wren have much to repay their efforts when once through persistent seeking they locate, slip up close to one, and catch a glimpse of this

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bird of their desires; for cañon wrens, though not so attractive in appearance as some of their highly colored feathered cousins, are really handsome little birds. The body is a beautiful reddish or rusty brown color, rather inconspicuously speckled with black and whitish spots and with an almost white, shield-shaped throat and breast patch that immediately attracts attention. The old vernacular name, "white-throated wren," was not so bad after all; for it pointed out this very prominent field mark which is so useful to the novice observer.

Remaining deaf to the "seductive summons" which call so many of the other birds to the warm tropic lands during winter, the cañon wrens stay with us throughout the year to sing their spirit-moving strains. Their range includes all that territory from the Sierra Nevadas on the west to the eastern boundaries of the Rockies, and from Idaho south to Aguas Calientes, Mexico.¹

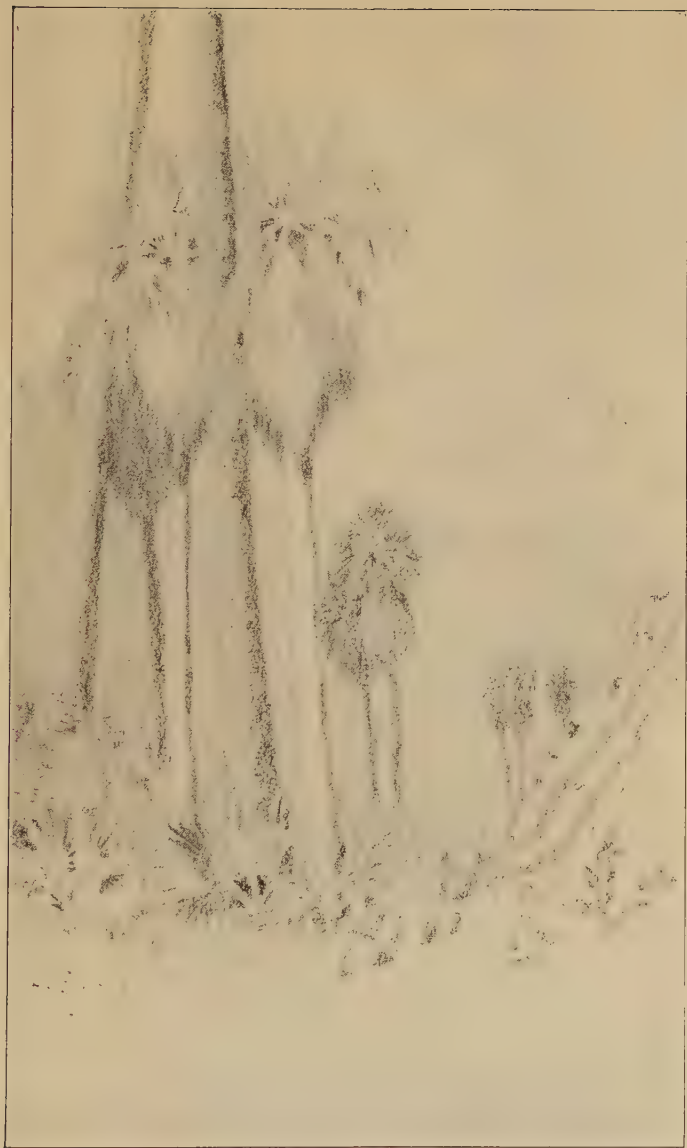
The breeding range of the dotted cañon wren runs from the cool, rocky gorges close to the

¹ They are resident birds only in the southern part of this region.

desert floors up to the upper limits of the yellow-pine belt. The nesting-site is very similar to that of the rock wrens, being generally a niche in the rock ledges, though records are given of nests being constructed about buildings and even in tunnels.

When once a cañon wren takes up his residence in a certain place you may be quite certain that you will hear him about in that vicinity through many seasons; for these birds, like the rock wrens, are a home-loving species. Four years ago a cañon wren chose a little gorge behind my house for its domicile, and every year since in autumn, winter, spring, and summer I have heard almost daily his sweet song ringing out clearly on the morning and evening air.

It seems strange, but this shy little bird will sometimes frequent the habitations of man. Dr. Chapman mentions the Mexican species of *Catherpes* singing on the housetops of Guadalajara, and, at Palm Springs on the Colorado Desert I every once in a while find them coming into the village, in some instances even entering the crudely built wickiups of the



ROCKY GORGE ENVIRONMENT, COLORADO DESERT
WASHINGTONIA PALMS IN FOREGROUND

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Indians in search of insects and crumbs. At Sacaton, Arizona, Mr. French Gilman found one building its nest in a slot machine on the porch of the hotel.

Besides the musical-scale song, *Catherpes* has another little song, the idler's song I like to call it, which is iterated again and again when there is little else to do and he is just sitting still and bobbing. As though to give added emphasis to what he has to say, he always gives his head a decided down-jerk as he sings it out, reminding one of the scolding Johnny owls. The rock wren's idler's song is a tinkling trill, but the cañon wren's note given under similar circumstances is a shorter utterance and lacks much of the resonance and metallic quality of the former.

Practically all of the wrens have what we might characterize as a scolding note, a sort of harsh gritty "*skee-eeep*" uttered as a protest against intruders or as an alarm note. The cañon wren's peppery temper often induces him to utter just such a rasping note, a sound so much in contrast to the regular vibrant, clear, ringing scale song that it is a surprise to hear it

BETSY BOUNCE, THE ROCK WREN

(*Salpinctes obsoletus*)

EARLY, early this morning, long before a single direct ray of the sun had brightened the rock-ribbed hills or desert sands, the rock wren was abroad as restless as a chipmunk, singing her shrill, chippering, tinkling song and ceaselessly darting in and out among the rock ledges looking for insects. And now that the sun is really up and the spiders are at rest, and the gauzy-winged insects are coming out of their hiding, she is busier than ever.

When I go out to watch her she has a funny way of standing still on a rock and bobbing up and down as if she were dropping me a curtsy, or were ever deciding to leap into air and then concluding, when half off, not to go quite so soon, but to watch me a minute longer. And in this particular she reminds me of the rollicking, sweet-voiced water ouzel of our mountain streams, or of her nearer relative, the trumpet-cañon wren. As she continues her funny,

restless bobbing antics she gives me a yet more funny song which, once heard, can never be forgotten, and which has been well characterized by Florence Merriam Bailey as "the most unbirdlike of machine-made tinklings," a shrill, metallic twitter, "Kree — kree — kree — kree." She has such pretty speckles on the breast of her grayish brown body and such a well-defined and prominent streak of white over the eye that you cannot, having seen her movements and heard her song, ever mistake her for any other bird. The bill, too, is distinctive, being exceptionally long (equaling the length of the head) for so plump and tiny a bird. It is slightly decurved at the tip and well adapted to pull the spiders, beetles, and day-hiding moths from the deep cracks in the rocks.

The rock wren is among our most widely distributed of Western birds, choosing her home amidst a variety of environmental conditions that puts her in a class by herself. This restless little rock-dweller makes herself as much at home among the sun-scorched rocks of the silent desert wildernesses as on the boulder-strewn hills of the moist coastal slopes; she

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finds as happy a domicile on the very pinnacles of our highest mountains as on the fog-drenched lowlands bordering the ocean — a cosmopolite, indeed, and everywhere a happy bird. Those living on the higher mountains go to lower levels during the winter, but the desert-dwellers make no vertical migrations during the year, remaining in their arid, sun-bleached home through the intense heat of summer as well as the pleasant days of winter.

The rock wren, like the mountain junco, is an agreeably sociable little bird, coming about one's quarters and making herself at home if given the least encouragement. My little Betsy Bounce, as I love to call the fidgety little rock wren that has made herself so familiar about my home, comes regularly each morning to the door to pick up the crumbs which I throw down for her, and when all is quiet she comes inside the house and, after crumbing the floor, hunts in every crack and cranny from floor to ceiling for insects. Not the tiniest crack escapes her sharp, watchful eye, though sometimes it takes her fully fifteen minutes of constant search to finish her task of routing out the spiders. Often

after completing her search inside she goes over the outside of the many-cracked shanty as carefully as she has gone over the inside. But I am confident she finds it unprofitable labor; for, since my house is, in true desert fashion, only one board thick, she must peer into the same cracks from the outside that she has already searched through from the inside.

As soon as I open my door in the morning I find Betsy seated on the rock just outside, fidgeting, bowing, and bobbing, and waiting for me to quiet down so that she can come in to get her crumbs and insects. If I am too long at getting my breakfast over, her bobbing motion takes on a more determined manner and she fidgets more than ever, showing her impatience, and vociferously protesting because I have kept her so long outside. I can almost hear her say: "Hurry up! Hurry up! I've been waiting on you a whole hour already!"

A long search among the rock ledges during March and April if you are on the desert, or later if in the mountains, may bring you to the nest situated in some deep rock nook or crevice. If the rock wrens have found it possible they

will have hidden it so deeply that it will be quite out of sight, and it may take considerable work on your part even to get a peep at it. But the nest or its situation is the least interesting feature. It is the unique paved entrance that most engages the attention. During the building season the birds become connoisseurs of flat and pretty stones, and these they scatter together with a few sticks about the dooryard of the nest. And these stones are not small ones either. Stones a quarter of an inch thick and an inch and a half long are the average-sized ones in the nests I have seen, but even larger ones are not infrequent. The quantity may be several handfuls. Sometimes in the vicinity of the coastal villages the rock wrens gather shells, pieces of china, and even bits of shining black coal to use in decorating the nest's entrance. Why such elaborate pains should be taken to decorate and "fix up" the tiny bird home is difficult to explain on other grounds than the bird's æsthetic sense — a taste possessed by many birds and animals. Mr. French Gilman tells me that one spring, in the vicinity of the Sacaton Indian Reservation in Arizona,

he found many of the newly made nests of the Abert towhees, Bendire thrashers, and in one instance the nest of the cactus wren, covered with the brilliant yellow blossoms of *Baeria*, or Sunshine. He was able to find no satisfactory explanation other than that the birds had been attracted by the highly colored flowers and had been induced by their sense of decoration thus to adorn their homes.

It is always easy to know when the time of nest-building is near, for the cock wren, who all the winter long has been rather monotonously keeping to one little ditty, now bursts out into the full melody of his courting song — a song insistent, positive, confident, and full of good cheer, and so different in quality and style from that which formerly came from his throat during winter that it is difficult to believe that a new songster has not appeared with the breezes of spring. All through the year the sprightly rock wrens are about the first birds up in the morning and with the towhees the last to retire at night, and now that they are especially noisy in song you are more than ever aware of their early risings and late retirings. The nesting

season begins late in February and lasts through to May and June, varying, of course, in a bird of such wide zonal distribution according to the locality. The desert birds have nested and reared their young before the mountain birds have laid the first eggs.

If there are any small birds that show themselves more concerned over the approach of an intruder toward the nest I am not aware of it. Such bobbings and screechings and restless flights and fidgety dashes as they engage in, fill one with both pity and amusement; pity, because of their deep concern and nervousness; amusement, because of their funny motions and calls.

THE ANTELOPE CHIPMUNK

THE ANTELOPE CHIPMUNK

(*Ammospermophilus leucurus*)

THE antelope chipmunks, or ammos, as they are sometimes called, are the liveliest, most active and agile of all the small mammals of the desert, and they hold an interest to us out of all proportion to their size. As they dash across the sands at such lively clips as they are wont to go, they remind us of tiny rabbits, immediately attracting our attention with their little white tails, or flags, which they carry curled up over their backs. So many points of resemblance are there both in general appearance and in movements between these little rodents and the chipmunks of the mountains that the desert people call them chipmunks, though they are really very small ground squirrels.

The desert antelope chipmunks are found in great numbers both on the Colorado and the Mohave Deserts, and beyond the borders of California nearly related species are found

living in Arizona, Nevada, western Colorado, Utah, and New Mexico. In general they confine themselves to the rocky hills and the borders of the desert where the soils are compact and offer favorable conditions for constructing their burrows. There are a few places where they are found well up in the mountains (4000-7000 feet), but in these localities the climate is very dry and the plants are desert-loving species. These spermophiles require a dryer climate than that existing in the coastal valleys, and in only a few instances have they been known to establish themselves on the Pacific side of the mountains.

The ammos do not localize their burrows or live in close colonies like many of the ground squirrels, but scatter their holes out quite uniformly over their range. They make their burrows in places affording a protection against enemies that dig, such as coyotes, weasels, and badgers, choosing a site generally near some bush or rock. The holes are distinctive in that the openings are generally more or less triangular in outline and have very little earth thrown up at the entrance; it is thus easy to

learn to tell them from the retreats of other small mammals of the region. The burrows are neither deep nor extensive. Last spring a number of desert chipmunks took up their residence near my house, moving from their quarters down on the flat up onto the mountain-side into an abandoned wood rat's hole, so that they could be nearer the place where I kept food out for the birds. Many a dispute they then had with the desert sparrows, the towhees, and the rock wrens at the food table. Being more audacious and pugnacious, the chipmunks always cleared the way for themselves and sent the poor birds away to get their share of the grain when they could.

Among this lot of ammos was one bully, a very large fellow, who always ruled the food yard with an iron hand; and he let it be known that all others who ate there did so at his sufferance. Upon his arrival the other chipmunks generally scurried off a little way and then approached cautiously to test out his good nature before eating in his presence. They seemed to understand that he had marked out his sphere of influence and that he was able to

defend it against all encroachers. • Very often there was much quarreling going on among them, and this was always accompanied by a great deal of noise, the ammos making sounds much like those made by quarreling mountain chipmunks.

Altogether there are about a dozen of these "chipmunks" that feed near my shanty, and during the day when no one is around to disturb them I generally find most of them nosing around hunting for something to eat. The number of track-marks that they make on the soft dirt in a day is amazing. Hardly a square inch of ground is there which they do not cover. Not a thing that is edible and open to their reach is undiscovered. Like most rodents, they are able to consume a surprising amount of food, and when they have more than they want they carry off the rest in their cheek pouches. When they find a store of food they are indefatigable workers, and will not leave it until the whole of it is placed safely away. Several times they got into the burro's barley bag, and I found that, though the cheek pouches of a single chipmunk hold but slightly more than a heaping teaspoon-



ANTELOPE CHIPMUNK FEEDING

ful of food, yet in a day they could carry away several quarts of grain.

The bill-of-fare varies a good deal with the change of seasons. During the early spring when succulent food is plentiful they eat many green plants. At other times they live on seeds such as those of the tree yuccas, cactuses, scrub junipers, and many kinds of grasses. During a part of the year they add to their dry diet the fruits of the cactuses. Like a great many of the smaller rodents they will eat flesh if they can get it.

In their search for food they become very brave even in the presence of people, and if one is quiet they will even enter the house and really become quite tame. They are always on the alert, however, and ready to run when the time comes for them to seek safety in retreat. Like the mice and wood rats they do not mind noise much, but the sight of any motion, however slight, is a signal of danger that sends them off to their holes in a hurry.

The ammos are quite dexterous in their use of the forepaws and they generally use them as hands to hold food up to their mouths.

Since at such times they are much given to sitting up on their haunches they assume quite a human aspect. I was recently much amused at the use a little chipmunk made of his "hands" while scratching for fleas on his rump. Not being able to get at the parts that itched very easily he grasped the skin with his left forefoot and stretched it around forward where with his right forepaw he *could* reach it. He saw to it that the skin was stretched tight and then proceeded to give it a thorough scratching. The little foot moved bewilderingly fast. Dear little fellow, even he had his troubles.

The antelope chipmunks are easily caught in box traps, but, unless caught very young, they make poor pets, being so shy that they stay closely hidden in the cages provided for them and seldom show themselves when any person is around. I have several times tried to tame them, but I have always soon set the little creatures free, reproaching myself for ever having subjected them to the fear which accompanied their being placed in a box.

Their progress when running is accomplished by a series of short, bouncing leaps, the tail

meanwhile being carried well over the back. When an ammo is pursued, he seldom goes straight to his hole. Generally he runs a little way and then stops and looks back to see if you are still coming. If you also hesitate, he will sit up on his haunches in true ground-squirrel fashion and with his head to one side assume a listening attitude. In this position of alertness he may remain for some moments. All the time the nose and the little side whiskers are kept in constant motion, and the tail is vibrated too. If now he is chased into his hole, the little fellow will stay underground for some time before venturing forth. His sense of caution is very great, and he will see to it that you are well out of sight or a good distance away before he again comes out into the open.

The antelope chipmunks do not like cold, cloudy, or rainy weather and they seldom come out of their burrows at such times unless very hungry. But the minute the showers are over they will be out everywhere enjoying the opportunity for exercise and foraging. During the winter months those living in the colder deserts and up in the mountains may spend several

months hibernating, but those on the Colorado Desert are active all through the year. However, even there the cold mornings of winter generally keep them in their burrows until nine or ten o'clock or until the sun has warmed up the rocks. They retire correspondingly early in the afternoon. Only once have I known a chipmunk to be out after dark. One evening in January at about 7.30 o'clock I heard plainly just outside my door the twittering, trill-like call of an ammo. What could have been the occasion for his being out at such a time must be left to conjecture.

Though these rodents can get along for unusually long periods without water, they enjoy a drink as well as almost any animal when they can get it. On the warm, dry summer days they frequently come down to the little ditch below my dwelling and, catlike, lap up the water. Frequently after they have drank they squat down on the sand and enjoy the shade of the mesquites. Generally they take a belly-down position with their little rear legs flattened out behind them. This, too, is the position they assume when during the heat of the

day they are resting under the cool rock ledges along the mountain bases.

As one rides over the desert one often hears the ammos' high-pitched, quavering call. It is so shrill and so prolonged that one can hardly believe that it comes from so tiny an animal. It may last for several seconds and only diminish in intensity and volume during the last phase, sounding then as though the little creature who makes it was losing his last vestige of breath. Since the call carries so far and possesses ventriloquistic qualities, it is exceedingly untrustworthy as a means of locating the animal.

THE ROUND-TAILED GROUND
SQUIRREL AND NEAR
RELATIVES

THE ROUND-TAILED GROUND SQUIRREL AND NEAR RELATIVES

(*Citellus tereticaudus*)

HE went out that morning into a world of plenty. The spring rains of the few days previous had sent millions of seeds to sprouting, and now the deserts were "coming green" again with a host of juicy annuals. Dainty wild flowers almost literally sprouted and bloomed in a day. The round-tailed chipmunk knew his rich feeding-time had come. Summer, autumn, and winter dry food had been good enough in their time, but they did not compare with the succulent green foods that came with the spring. He, like the Indian, would eat in the day of his plenty, and on this particular morning his provident nature seemed to urge him to special activity. As he foraged outward from the site of his hole, he seemed to have lost all sense of stomach capacity. His stomach seemed an unfillable cavern, and he stuffed and stuffed. To

be sure, he felt a little clumsy as his sides began to swell, but what of that. Was it not the day of feasting and abandon? Consequences could now go to the four winds, at least for once.

Now, there are times when even a wild creature can eat too much and be too greedy for his own good. The round-tailed chipmunk found it out this very day and almost paid for his feast with his life.

The approach of a coyote who was foolishly nosing about had sent him on his heels toward one of the holes of the colony to which he belonged. He had purposely remained fairly close to home; for he was aware of the danger that accompanied distant excursions. His prowess as a runner had always been good and he now trusted his legs to take him to his hole in a hurry. But, alas, he had taken on too much "ballast." His distended stomach made it almost impossible for him to drag himself away. However, his sense of extreme danger spurred him on to unusual activity and he finally reached his hole. But now, but now, just when he thought himself about to safety, he found that though the nose and neck went down the hole

made in the day of his leanness, his fat, over-filled, pendent belly would not come on in after him. And the coyote right behind! He wiggled, he squeezed, he scratched and pawed and gave a whistling squeal, but that little round ball of a body could not be made to fit the small hole. Realizing his plight he now threw himself backward, and rushed to another hole. As luck would have it, this second hole was better suited to his need, and down he went, one last flop of his tail all the coyote saw of this fear-stricken, round-tailed chipmunk.

The vernacular name, "round-tailed chipmunk," given to this animal on account of its small size, is a misnomer; the proper name is round-tailed ground squirrel. So wary are these animals that people often travel for days through the desert and never even suspect their presence. They are exceedingly shy creatures and scurry to their holes at the first approach of a stranger. Considerable patience and much sitting still is required if you wish to observe them. About all the average desert traveler ever sees of them is occasionally a little gray or brownish form scuttling down a hole,

or once in a while an adventuresome individual in a mesquite tree harvesting blossoms. There is nothing prepossessing in the appearance of the round-tailed ground squirrels. The ear conchs are so narrow as to be mere rims, and this gives the head a sort of roundish, bald aspect. The tail is quite bare of hairs and the pelage is almost always coarse. Nevertheless, we must account them interesting little creatures because of the unique place they occupy among the small mammals of the arid regions of the extreme Southwest.

Of the several species inhabiting the desert region, the Death Valley ground squirrel has the distinction of occupying a region wholly below sea level in the lowest, hottest place on our continent, a habitat such as no other North American rodent can boast of. The Yuma round-tailed ground squirrel dwells in the low-lying, sandy region in the vicinity of the Colorado River in California, and the Imperial Valley north to the Salton Sea. The northwestern arm of the Colorado Desert, from the Salton Sea to the San Gorgonio Pass, is inhabited by the Palm Springs round-tailed ground

squirrel. Each species thus occupies a very definite area; and neither trespasses on the ground occupied by the other.

The narrow, troughlike depression now known as the Colorado Desert of California was once a portion of the bed of the Gulf of Lower California. Then as now the Colorado River, brown with its heavy sediments of silt, was emptying its waters into the Gulf and pushing its delta across the narrow sea valley. In time the sediments were deposited in such quantities that the stream built up for itself a channel higher than the waters of the Gulf itself. Not only this was done, but the delta was built out sufficiently far to divide the narrow arm of the ocean into two parts, one part still opening into the ocean, and the other part forming an inland sea. This latter body of water is known to geologists as the Blake Sea, it having been named in honor of Professor William P. Blake who accompanied the expedition which first satisfactorily explored the region. The isolated waters of the inland sea soon began to dry up under the intense heat of the desert sun, and, as they receded from the moun-

tain borders at the northwestern end of the sink, there came to exist there a large, flat, isolated area separated from the other adjacent regions by high mountains and the remaining waters of the great Blake Sea. The animals and plants which came to occupy this region, being cut off from others of their kind by natural barriers, in many cases finally developed characters peculiar to themselves, and in some instances these characters became sufficiently marked to form new species. The Palm Springs ground squirrel was one of these animals that have shown in marked manner the effects of this isolation. Although the ancient Blake Sea has dried up and the recently formed Salton Sea is the only physical feature restraining the general distribution of the ground squirrel over the sands of the entire Salton Sink, yet he clings to his ancient home and maintains his identity as a distinct species of the northwestern arm of the Colorado Desert.

ELEODES, THE BEETLE THAT STANDS
ON HIS HEAD

ELEODES, THE BEETLE THAT STANDS ON HIS HEAD

(*Eleodes sp.*)

ANY one who has traveled much in the region west of the Mississippi, especially in the South-western United States or Lower California, must have often seen the curiously behaved and pungent-odored pinacate beetles or tumblebugs (*Eleodes*). These interesting, black-bodied, hard-shelled beetles are so prevalent in one part of Mexico that a mountain range and the whole surrounding region has taken its name from them. I refer to the Pinacate mountain country of Sonora.

The outstanding feature of interest in respect to these creatures is their habit when alarmed or disturbed of elevating their bodies and literally standing on their heads. If excited too much while on the run, they will frequently tip themselves up vertically so quickly that they tumble heels over head, often landing on their backs. They then will either feign death or

turn over quickly and try to make away as hurriedly as possible — their second hurried run often ending in another somersault as ludicrous as the first. It is not surprising that the children often call them "circus bugs."

I recently spent several hours trying to find out just exactly how *Eleodes*, the tumblebug, rights himself so effectively and quickly when after a tumble he lands on his back. The performance is done so rapidly that it takes some patience to find out the order of procedure; but when one wants to find out movements employed in so adept a trick he cares little about time.

And now this is the way it is done. The two middle (second pair) legs are straightened out downward, thus elevating the inverted beetle off the ground. When the body is well propped up, one of the rigid legs is suddenly elbowed so that the insect quickly goes down on one side, and a rotary movement is started. A slight heave now given by the rear third foot on the opposite side sends the insect over, and away the beetle runs.

But sometimes *Eleodes* is not so awkward that

he tumbles over, and then you see him assume the head down position and stay in that attitude for minutes at a time, so long that you would judge him weary beyond endurance. He generally waits until you go your way and then scuttles under cover.

The actions of this beetle that kicks his heels into the air are explained to the satisfaction of the Zuñi Indians in a curious little folk-tale entitled "The Coyote and the Beetle." I give it as told by Mr. Frank Cushing in his charming "Zuñi Folk-Tales":

Well, in ancient times on the pathway leading around Fat Mountain, there was one of these beetles running about in all directions in the sunshine when a Coyote came trotting along. He pricked up his ears, lowered his nose, arched his neck, and struck out his paw toward the Beetle.

"Ha!" said he, "I shall bite you!"

The Beetle immediately struck his head down close to the ground, and, lifting his antennæ, deprecatingly exclaimed, "Hold on! Hold on, friend! Wait a bit, for the love of mercy! I hear something very strange down here!"

"Humph!" cried the Coyote. "What do you hear?"

"Hush! Hush!" cried the Beetle, with his head still to the ground. "Listen!"

So the Coyote drew back and listened most attentively. By and by the Beetle lifted himself with a long sigh of relief.

"Okwe!" exclaimed the Coyote. "What was going on?"

"The GOOD SOUL save us!" exclaimed the Beetle with a shake of his head. "I have heard them saying down there that to-morrow they would chase away and thoroughly chastise everybody who defiled the public trails of this country, and they are making ready as fast as they can!"

"Souls of my ancestors!" cried the Coyote. "I have been loitering along the trail this very morning, and have defiled it repeatedly. I'll cut!" And away he ran as fast as he could go.

The Beetle in pure exuberance of spirits turned somersaults and struck his head in the sand until it was quite turned.

Thus did the Beetle in the days of the ancients save himself from being bitten. . . . Thus shortens my story.

Though often spoken of as a bug, this insect is a true beetle. We know this because he chews his food and has hard horny wing covers. Bugs always suck their food through a long, needle-like proboscis, or beak, and they have soft wing covers. One day I became curious to know what was under the high arched wing covers of the tumblebug. A dissection revealed that a great



A DESERT WASH, OR DRY, SANDY STREAM-BED
THE HOME OF THE LE CONTE THRASHER, THE KIT FOX, AND THE COYOTE
AT THE LEFT, THE SMOKE-TREE (*Parosela spinosa*)

hollow air-filled space took up most of the room, and that only a very little place was given for the abdomen. This explained to me why I had always been deceived when I attempted to judge the weight of the tumblebug by his size.

The food of these beetles is largely dried vegetation and fungi. This is true both in the larval and in the adult stages; hence I cannot see any special virtue in ending their lives by stepping on every one one sees, as is the habit with some unthinking and cruel people. The pinacate beetles, as they are often called in the Southwestern United States and Mexico, exhibit a good deal of dexterity in eating their food. Time and time again I have seen them hold a food morsel down to the ground with one foot, much as a dog does his bone, while gnawing it. Also I have seen them take up a piece of food and run away with it when disturbed, holding it up with their two front feet as they made away.

There seems to be no place too desolate or sunscorched for these creatures to live in.¹ On

¹ My notebook records the finding of these insects on the very summit of San Gorgonio Peak (11,485 feet), a fact which shows their wide altitudinal distribution.

my journeys across the bleakest wind-swept sands of the deserts, where the very minimum of animal life was existent, and where few species of even the hardest xerophytic plants eked out a miserable round of life, I have found the pinacate beetles in comparative abundance. They are exceptionally hardy creatures and even in such untoward places live to be several years old; at least this may be said of the more resistant species. Most of the species are night wanderers, but many are abroad in the scorching light of the desert days.

THE MASON BEES

THE MASON BEES

(*Anthophora* sp.)

As I turned into the little trail and climbed the steep, rock-strewn slope that leads up to the entrance of the precipitous cañon behind my house, the herb-scented winds that blew so steadily from off the warm sands bore to me the hum of industrious bees. Turning expectantly, I walked back to my right a short distance, and there at the base of an enormous rock I found the dry, bare, hard-baked ground covered deep with small pellets of earth resembling worm castings, and riddled with the holes of solitary bees. So many were the burrows that the ground looked like the top of an enormous pepper-box. Above were thousands of busy insects flying about — a bedazzling, buzzing cloud of industry that almost made me bewildered as I looked at it. I took it for granted that the bees were tolerant creatures and too busy to give me much attention with their stings, and in this confidence I was not disap-

pointed. In order to see them to greatest advantage I got right down on my hands and knees, and much of the time held my face and magnifying-glass within a few inches of the openings of the burrows.

I soon succeeded in locating among the cloud of diligent bees one that was trying to find a site for her nest. In making this determination she was aided by her antennæ, with which she was stroking the adamantine earth. She seemed restless, and often made circling flights above the place she was inspecting. When once she had decided upon a site, she began immediate operations on the burrow by squirting saliva from her proboscis upon the ground in much the same fashion that a Chinaman squirts water from his mouth when sprinkling clothes at the laundry. This gave her a sort of human look that was most amusing. With the aid of the dexterous mandibles she took up the soil, quickly made it into small pellets, and then clawed these out with the forefeet. Again she squirted saliva — several jets of it — and more earth was scraped out.

The work of throwing out the earthen pellets

seemed to be an easy task for her until the hole was over "bee deep." But after the hole grew deeper our excavator found the task so difficult that she had to adopt new tactics. So now she began throwing the earth beneath her and out of the hole with her rear legs. One could not help comparing her motions with those of a dog digging an animal from its hole. To keep the tube well rounded I could see her constantly turning her body this way and that, as she worked now on one side and then on the other. The edges of the burrow and of the cylindrical tubular case itself were smoothed and made firm by the constant application of wax, secreted from glands on her own body, and squirting on of saliva. When the tube was completed, she built about the orifice a small circular collar of mortar which she compounded of particles of earth, minute pieces of gravel, and her own saliva, so that the hollow, cistern-like cell looked very much like an old-fashioned well with its round curb, or coaming, about the opening. Ten minutes after it was made, I was amazed to find that this cement had set so hard and had become so rigid that, although I did

my best to crush the little collar between my thumb and forefinger, I found it impossible; and the circular curb was less than an eighth of an inch thick! The bee's success as a cement-maker must ever remain a recurring wonder to man.

All the time our mason was working on her cell she had to be on the lookout for the lazy bees who were trying to snatch an opportunity to get possession of a cell without doing the necessary work of making it. The sense of proprietorship was very strongly developed in this bee, and, when any other bee came too near her domicile, she hustled her off her premises in a hurry. Often she jumped upon the trespasser and with stinging arguments engaged her in a rough-and-tumble fight, the two bees rolling over and over in the dust while it was going on.

When complete, the mason's burrow was about two inches deep. It went straight downward at first for about an inch and then curved slightly to one side. This last part, which was to hold the honey and the egg, was a little larger than the tube above it and much resembled a small pocket.

That most beautiful of all our salvias, the thistle sage, was growing plentifully in the vicinity and spreading 'abroad over the desert the glory of its ethereal, lilac-blue blossoms. To these honey-laden flowers the mother bee now made constant trips, for from these she must get the sweet nectar and pollen that make the molasses-like paste on which the grubs are fed. Thousands of other bees were engaged in the same necessary industry and the air about was filled with the humming of the zealous workers. The mother early provisioned her cell with a store of honey and pollen, mixing the paste according to the "inveterate and fixed routine of her ancestors"; always the honey was disgorged from the mouth, and then the pollen brushed off the hairs beneath the body, and the two substances mixed. The paste filled the burrow almost half full, and on this the minute egg was laid.

Now began the work of sealing up the cell. This was accomplished by laying in a thick concave plug of pure hard wax. This complete, the bee began, to my surprise, excavating all about underneath the little earthen collar about

the entrance of the hole — the collar, which at such an expense of care and labor, she had built but a few minutes before. Never did she leave her exertions until the beautiful coaming, now undermined, fell into the pit she had made, broken forever. In the case of some of the other bees I watched, the small ring of mortar was loosened and carried off in sections just before it caved in.

The time was now ripe for making a final filling of the opening above the wax plug; for not a sign of the burrow must remain to lure parasites to the precious honey treasure beneath. The mother bee accordingly went about the edge of the hole and scraped earth into it until full. Again so near were her motions like those of a dog burying his bone that it was hard to realize that this small creature was an insect and not some diminutive mammal.

This was but one of several burrows that this mother and her consorts made in similar manner. Hour after hour for several days the industry of burrow excavating, provisioning, and sealing was plied, and never ceased until

the sun sank low beyond the mountains and the last rays of the evening lights tinted with their afterglow the desert plain and its bordering hills.

Weary with the arduous labors of the day those bees whose domiciles were not yet complete, corked the entrances to their burrows with their own bodies, placing them in upside down position with only the tip of their abdomens protruding. Thus did they guard their honey treasures from the night marauders and noxious parasites.

As soon as the sunshine of the morning came to warm up their chilled and stiffened bodies, they were again at work. Those who had completed their cells the night before were now fashioning new ones, and those who had incomplete burrows were busy putting on the finishing touches. Each bee lays from eight to ten eggs, and for every egg a cell was made and provisioned with the honey paste.

After the third day the burrows were all complete and the adamantine ground looked almost as it had before. The bees had abandoned the scene of their labors and doubtless

were never to see it again, nor the offspring that should later emerge to take their turn at the brief space of life allotted to the solitary bees.

THE DESERT BIGHORN AND NEAR
RELATIVES

THE DESERT BIGHORN AND NEAR RELATIVES

(*Ovis nelsoni*¹)

IN the most inaccessible cañons, and on the rugged, barren, and desolate heights of those isolated mountains of mystic solitude which thrust their serrated pinnacles and roughened shoulders upward from the level of the desert plains, dwells the largest and most majestic of desert animals, the desert bighorn. It seems strange that this near cousin of our Rocky Mountain bighorn should find conditions congenial to his tastes in an almost waterless land whose summers exhibit an unusual number of

¹ Until quite recently all of the Far Western desert bighorns, including those which occupy the mountains of northern Lower California, were thought to belong to the species *nelsoni*, but now it is shown that the sheep occupying the Lower California highlands belong to the species *cremnobates*. The Nelson bighorn, the type specimen of which was taken by Mr. E. W. Nelson, of the Biological Survey, on the Grapevine Mountains of California, is the dominant species of western Nevada and eastern California. The form found in the low desert ranges south of the Gila and east of the Colorado River in Arizona and northern Sonora is referred to the subspecies *gaillardi* of the Rocky Mountain bighorn.

days whose temperature reaches a hundred degrees or more. But he is the hardy frontiersman of his race, enjoying, like our Western settlers and adventurers of the early days, the buffetings of the stern elements and the freedom of the wild places. Among all his kinsmen, it is he that has ventured farthest southwest from the original ancestral home in the elevated plateaus and mountains of Turkestan.

The male desert bighorn, with his stocky body, noble, splendidly poised head, and massive, gracefully curled horns, is a picture of animal vigor. There is an appearance of natural composure and dignity about him that must compel the attention of the most disinterested observer. He is somewhat smaller in size and paler in color than the Rocky Mountain bighorn, but a no less imposing creature. A full-grown individual is as large as a third-grown heifer, and may measure close to sixty inches from point of nose to tip of tail. As is usual among wild sheep, the female is smaller than the ram and the horns are much reduced. Stephens gives the average weights of an adult male and female Nelson bighorn as two hun-



DESERT BIGHORN (*Ovis cremonobates*)
GROUP IN THE CALIFORNIA ACADEMY OF SCIENCES

dred and fifty and one hundred and fifty pounds respectively.

Few animals support a head as heavy in proportion to the size of the body. A head and neck I have before me as I write weighed forty pounds when taken. The cores of the great horns are made of almost solid bone, and these add greatly, of course, to the weight of the rigidly built skull. Imagine if you can the nature of the impact of such a battering organ when driven forward by the strong body engine. Is it strange that in the battles which take place for the possession of the ewes necks are broken and lives exacted?

The growth of the horns of wild sheep is a curious phenomenon which has attracted the interest of naturalists for many years. The bony vascular core borne on the frontal bone is permanent, but its covering is renewed from time to time by the growth of a new sheath of cornified epidermis. This new cone of horny tissue is formed on the surface of the bony core, and as it thickens, the growth of the preceding season is pushed outward toward the end of the horn. Since the horn-sheath is not shed at any

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regular time, but slowly splits off and wears away through contact with the brush and rocks (the oldest always going first), there is found at any time the remains of many seasons' horn production, each marked by a ring showing where the cornified growth of the preceding season broke loose at the root as it was pushed outward toward the apex of the horn. Desert sheep are rarely to be found without broken horns. This, according to one authority, is due to the fact that they use them in seasons of drought for prying among the rocks and boulders in search of certain succulent bulbs which serve them as thirst-quenchers until the springs are replenished and flow again.

Flocks of bighorns must of necessity occupy pretty well-defined areas contiguous to the infrequently found water-holes and springs. They generally come to the tinajas or tanks to drink in the late afternoon or evening. The waters of the smaller springs are often heavily impregnated with mineral salts, but that found in the tanks — as the natural reservoirs of the desert cañons are called — is pure and delicious, the supply being renewed by every rain. These

deep, rocky, gravel-filled basins are nearly always located just below some high "dry fall," and the sheep must often approach them over steep, tortuous paths. This is a decided advantage to them, as it gives them an opportunity to note the presence of enemies before descending for water.

There are no definite migrations among bighorns except the vertical ones. At the approach of winter the sheep living in the higher mountain ranges, such as the Funeral, Santa Rosa, and Providence Mountains, descend to the lower rocky foothills and mesas adjacent to the desert plains to feed on the galetta grass; but they go no farther. They know better than to abandon rough grounds, for it is only on such surfaces that they are able adequately to protect themselves and their young from the persecutions of coyotes and man. Sheep have been known to cross the open desert, but, as Dr. Mearns observed, they are probably at such times passing from one mountain range to another.

When spring arrives the flocks work upward to the zone just below the piñons. At this

season and during the summer the tender twigs of teamster's tea (*Ephedra*) and the new leaves of the buckthorn, rhus, and other shrubs are eaten in preference to grass. When I questioned the Indians concerning the summer food of the desert sheep, they almost invariably told me that the bighorns then ate many barrel cactuses, breaking them open with their horns. This I can readily believe, for I have often seen evidences of their banquets in the kitchen middens about the bases of the mutilated cactuses.

The single young is brought forth in March. By this time the ewes have retired to places of seclusion, selected because of their inaccessibility to predacious animals. The mothers with their young are always exceedingly alert, watchful, and sagacious, and from their favored positions they can easily detect the oncoming of a gunman or other enemy. When approached they may allow their impelling curiosity to hold them for a while, but at the proper time they quietly drop over the edge of the prominences which they have been occupying and by the time the pursuer has reached their former post

they are far out of sight. They are very active and sure-footed animals, their capacity for exertion is almost illimitable, and on such occasions they do not hesitate to descend by seemingly impossible leaps to the shelf-like ledges far down the steep walls of the slotlike gorges of their mountain home. The lambs are able to follow their parents down the steepest cliffs without the least difficulty. To pursue the sheep to such dizzy positions is almost impossible or too laborious and hazardous for the most brave-hearted gunmen.

There is something incredible in the story that bighorns in jumping over cliffs alight on their horns, and those who have really become acquainted with these animals in their wild home will not venture to tell such tales about them. In fact, such persons are emphatic in their denials of such foolish and fanciful statements.

Almost incessant hunting by Indians, prospectors, and lawless professional hunters has so reduced the original bands of desert sheep that few large flocks remain. The automobile has now enabled the indiscriminating city

hunters to get back into remote mountain ranges where until lately the sheep had at least some immunity from molestation because of their isolation. The hunters who go into the desert by automobile are too often unwilling to hunt in real sportsmanlike manner, and they resort to the most miserable and contemptible means for bringing in their game. Having supplied themselves with plenty of ammunition (generally enough, as one old-timer said, to kill all the sheep between Death Valley and the Mexican border), tobacco, and grub, they locate a water-hole to which the sheep are accustomed to resort, and then wait for the sheep to come in to drink. Often they care nothing for the age or sex of the animals, and an indiscriminate slaughter of the young and females through many seasons is bringing its sure result — a gradual extinction of one of our noblest desert animals. It is remarkable that the sheep have held their own as well as they have.

DON COYOTE

DON COYOTE

(*Canis ochropus estor*)

WHETHER out of curiosity or contempt everybody seems to be interested in the ways and doings of the clever coyote. His ability to raid hen-roosts successfully without being caught, and his cunning in combination with his seeming cowardice, have brought him into disrepute among all people. Perhaps no Western animal has had so many cursings breathed upon him.

And if he is held in contempt among men, what must his social standing among animals be! Surely none of them love him. I have watched too many merry waltzings of the kangaroo rats on the moonlit sands broken up by his approach, seen where too many mouse homes have been dug out and destroyed, witnessed rabbits escape capture too often to have any doubts as to just what they must think of him. Even the dog, his nearest cousin, ordinarily disavows any relation to him and

snarls and barks savagely at him when he comes near him on the hunt. It is not strange that in the Southwestern Indian folk-tales, wherein the coyote figures so largely, the smaller animals make him the butt of so many jokes and that they give him so little sympathy in all his troubles.

Like an outlaw the coyote is a wanderer ever on the move and swift of foot. He makes his miserable home among the rocks of the shrubby hills or seeks shelter in holes made in the steep banks of barrancas or washes leading down from the mountains. In these retreats he spends his days, but when the first stars are beginning to show themselves he comes out of his hole, shakes his dusty coat, and, after giving a few short, ringing, yapping barks to announce himself to his comrades, sets forth on the long hunting excursions of the night. These journeys are often of remarkable length, it being not uncommon for him to travel ten or twenty miles out across the desert and back again before sunrise and breakfast.

It is both interesting and amusing to follow the tracks of this shiftless, seemingly homeless



DESERT LYNX



COYOTE AT BAY

fellow over the sandy dunes, watching where he goes, now in a straight course, now running out of his way to smell down some rat hole, then again going with an aimless gait on and on over the sands until again arrested by some silly curiosity. The position of the track-marks made on these unhurried excursions often shows that he runs somewhat sidewise, as is common with little dogs, to prevent his feet from hitting. When you see where he has been on the swift chase, signs of this peculiar gait are not apparent.

Sometimes when hunger drives him to it the coyote is out and on the hunt during the day, and occasionally then you will get a good look at him and see him chasing his game. The larger animals like the rabbits he obtains by running them down in the open where there is little chance for them to elude him. What mice and wood rats are not obtainable on the chase are dug from their holes and gobbled up before they have time to escape. The coyote's meddlesome nose leads him to many a clutch of quail's eggs, and he leaves nothing to tell of his visit but broken shells and a yolk-stained nest.

Beetles and grasshoppers, horned lizards, and even the bitter-skinned toads are used for food. In spite of his bad odor, the skunk is preyed upon. The coyote's strong appetite for young pigs, chickens, and sheep is an impulse which leads him to the rashest butchery, so that not without cause is he almost universally declared by "cowmen" to be the "worst varmint that infests the earth." Once having tasted blood, he seems to lose all sense of prudence and of fear, and he comes about the ranch yards in the broad light of day and walks boldly among the cattle pens awaiting his chance to seize any unsuspecting fowl or young pig which in search of food may have wandered too far away from the barns.

During years of terrible drought, when the springs dry up in early April and scarcely a blade of grass comes up to provide food for the hungry, lean cattle that wander over the hills, the coyotes become very aggressive, take advantage of the weakness of the mother cows, and snatch the young calves when scarcely born. If a calf is attacked when near other cattle, the whole herd, hearing the bellowing

of the mother, will likely come to the rescue and charge upon the murderer. This, the coyotes seemingly know, and so they prefer to find some miserable cow and her calf out alone on the range. Even full-grown cattle may be attacked when through weakness and thirst they get down and are unable to resist the onslaughts of voracious enemies. On such occasions the coyotes approach them from behind, and, while the poor animals are yet alive, they will tear out their entrails.

A prospector by the name of Gus Lederer, who lives at Corn Springs in the Chuckawalla Mountains of California, complains bitterly to me about the way the coyotes kill all his cats. A coyote scalp with a bunch of chicken feathers and a piece of cat's hide were here nailed upon a palm tree as a proclamation and warning of what may happen to any other coyote that may become too familiar about his place in the future.

At certain seasons of the year, when other food is scarce, coyotes eke out a scanty living by feeding on dry manzanita berries, gourds (hence often called coyote melons), dates from

the Washingtonia palms, and other dried fruits. Lean bones tell the tale of hunger and under-nourishment, but no one cares. That is what one gets for being a coyote. If driven to it, this ever-hungry animal vagabond will even eat carrion and not be ashamed. I have often wondered if he rolls on the carcass, as dogs do, before eating it.

The coyote possesses a special fondness for watermelons, and always seems to delight in plugging the ripest and best ones in the patch. He is never satisfied with a single melon's flavor, but insists on taking a sample bite or two out of every good melon on the place. Here again he lets his foolish eating habits run at cross-purposes with the desires of man and invokes retribution upon himself in the form of poisoned fruits, traps, and rifle balls. In the Colorado Desert the date-growers tell me that the coyotes are so fond of dates that they climb up into the young trees to rob the fruit.

Now it must ever be remembered that the coyote in spite of his sins plays a valuable part in preserving the balance in nature. Were it not for his keeping the rabbits and ground



COYOTE-PROOF HENHOUSE MADE BY THE
CAHUILLA INDIANS OF CALIFORNIA
THE LADDER IS REMOVED AT NIGHT AND THE CHICKENS
ARE SAFE

squirrels in check, the country would long ago have been overrun with these troublesome rodents. Few of the ranchers who rail at the coyote for his raids on their chicken coops and vineyards realize what value he is to them. The few hens and grapes he takes are small pay for the number of destructive, grain-eating rodents he annually destroys. Last autumn, when I journeyed one very early morning through a little mountain village where the settlers were clearing land and raising their first crops, and counted the jack rabbits in some of the fields, I found sixty-two, in one instance, on an acre plot of corn. It did not surprise me that there was little worry expressed in the neighborhood over the toils attending the coming harvest season. The rabbits had taken everything. These same settlers had carried on for some time a consistent and continuous campaign of coyote trapping and this plague of rabbits was the result. They must now assume the burden of controlling the rabbits by themselves at cost of time, labor, and money, to say nothing of the loss of crops in the meantime. "Civilized man has [often] proceeded

so far," writes Lankester,¹ "in his interference with extra-human nature, has produced for himself and the living organisms associated with him such a special state of things by his rebellion against natural selection and his defiance of Nature's pre-human dispositions, that he must either go on and acquire firmer control of the conditions or perish miserably by the vengeance certain to fall on the half-hearted meddler in great affairs. We may, indeed, compare civilized man to a successful rebel against Nature, who by every step forward renders himself liable to greater and greater penalties, and so cannot afford to pause or fail in one single step."

All who intimately know the coyote concede that he has a good sense of humor and that there lurks behind those cold, crafty, green eyes a passion for trickery. It is a great sport of his to tantalize and play jokes on the ranch dogs by keeping them up and in a state of growling ill-humor half the night, robbing them and the ranch people who own them of half their sleep. He will bark beguilingly for hours, using his

¹ *Kingdom of Man* (1911), pp. 31-32.

ventriloquistic powers to lead the dogs off in the wrong direction, while his mates, who aid him on the hunt, sally into the sheep corrals and carry off the fattest of the flock. Finding the sheep disappearing at the hands of this murderous rogue, the rancher puts out his traps, but too often finds the cunning shrewdness of the coyote outwitting his best efforts to catch him. Unless the lure of bait is extraordinarily attractive and free from human taint, or the traps unusually well placed, the "educated" freebooter will never be caught. He recognizes that man is his worst and most insidious enemy, and he looks suspiciously and contemptuously upon all human inventions to work his ruin. To show his scorn and let the farmer know how near he has been to the cruel trap without being caught, he often defiles the trap with his excreta, leaving his enemy to curse the wily and elusive creature who again has outwitted him and rendered nugatory all his best efforts to protect his sheep.

The female coyote is a conscientious mother, and it is a profound moment in her life when the little grayish-brown puppies are born into the

world of light. The old roving nature now gives way to the maternal instinct to stay as much as possible about the den and guard, suckle, and train the young. The number of puppies in a litter is about five, born during the first days of April. They are as awkward and clumsy as can be, with big heads and ears out of all proportion to the size of their bodies. I occasionally meet some desert man who entertains the curious idea that coyote mothers feed their young by regurgitation; that is, by first eating and half digesting the food themselves and then throwing it up into the young coyotes' mouths. One old fellow regarded me with somewhat of a look of mingled scorn and pity when I showed hesitancy in believing his statement to that effect. The truth is, of course, that, like all baby canines, the young subsist entirely upon the mother's milk until they cut their teeth. But even before they have learned to eat solid food, you may see them almost any day playing about the hole making pretense of chewing on old bones or playing at tearing the carcass of some animal the mother has brought in for their delight and to encourage the strengthen-

ing of the baby jaws. They are a rollicking lot and are quite as ready to chew at one another's feet and ears as upon other objects. They tumble and roll, growl, scramble and scrap in sham fight, their green, close-set, slanting eyes expressing the happiness they enjoy. Play is now the fundamental, uppermost, and dominating business of their lives. The instincts of youth urge them on to the expenditure of their overflowing energy in the matching of strength, and in this competitive play they acquire the elasticity of mind and muscle so essential in after life. The mortality among young coyotes is not great; for their natural enemies, with the exception of man, are few. In a remarkably short time after birth these puppies are ready to shift for themselves and meet the hard struggle before them.

Coyote puppies early learn that their greatest safety lies in flight when danger confronts them. Curiosity seldom leads them to sit still or stand and look when they are approached. Brand this trait with the ill-sounding name of cowardice if you will. It is this so-called cowardice that means to the coyote triumph in the arena

of efficiency and the attainment of that which is dearest to the heart of all living creatures — the continuance of life. The law of self-preservation is written deep upon the mind. Its biological significance is great. What animal has been able, like the coyote, to baffle hunters and trappers and preserve its kind under conditions so wretched? Except in the most civilized parts of his old range he still seems almost as plentiful as ever, and his dismal barking serenades may still be heard at night in the foothills and plains as of old. During a series of seasons when high prices for pelts prevail, he is much reduced in numbers (during one winter recently when skins brought as high as ten and twenty dollars apiece, over four hundred skins were taken out of the Searles Lake region on the Mohave Desert alone), but as soon as prices drop again and trapping ceases, the loss is quickly replenished.

The most serious disease to which coyotes are subject is hydrophobia. When once they get it, the consequences are always serious, especially to man. In their mad wanderings over wide districts they bite skunks, dogs, cattle, and other

animals, and these in turn attack and communicate the disease to human beings. Serious outbreaks of rabies are thus experienced from time to time, especially in the more remote regions where the coyote is still abundant.¹ The little spotted skunk generally gets the blame.

¹ So dangerous was the widespread outbreak of rabies among coyotes and bobcats in Nevada and southwestern Idaho in 1916 that Congress made an emergency appropriation of \$75,000 to help combat the disease.

"During the year the State authorities of Nevada treated more than sixty persons who were bitten by either wild or domesticated animals. So great was the dread inspired by the presence of these maddened wild animals that children were accompanied to school by armed guards. Driven by their rabid blindness, coyotes entered the yards of dwellings, attacking dogs, cats, human occupants, or any object they might encounter; they entered feed lots and snapped and infected cattle, sheep, and other domesticated animals; and also attacked pedestrians, horsemen, and automobiles on the public highways. The destruction of live stock was enormous. In a feed lot at Winnemucca, Nevada, a single rabid coyote caused the loss of twenty-seven steers. The State of Nevada promptly appropriated \$30,000 to coöperate with the United States Biological Survey in waging a campaign against the pests in that State. . . .

"The movements of live stock between their summer and winter pasture ranges, with accompanying movements of dogs and predatory animals, made possible an extension of the disease into the contiguous territory of eastern Oregon, southern Idaho, northern California, the western half of Utah, and even into eastern Washington. Cattle and sheep were destroyed in large numbers through the extension of the disease, and at least 1500 persons were bitten by rabid animals." (*Yearbook of the Department of Agriculture, 1920.*)

Dogs and coyotes readily interbreed, with the result that you will find in country places, especially among the Indians, who seemingly care little about the breeds of their dogs, mongrels of every gradation. The domestic dog is naturally jealous, pugnacious, and brave, but when he has the least bit of coyote blood in him he is almost always worthless to the needs of man. He is then shy and distrustful, and on the least occasion sneaks off and runs. His form is lean and his coat lacks the luster, smoothness, and fineness of the domestic stock.

The ordinary coyote's color is a brownish gray, but those of the desert regions are nearly always of a lighter color in harmony with their surroundings. Once in a while an albino coyote is found, an animal whose hair is pure white. Lumholtz, in his delightful travel book, entitled "New Trails in Mexico," tells of several observed along the shores of the Laguna Prieta and at Carborca. I have never heard of a pure black coyote, melanism evidently not being as much exhibited among them as among foxes and some other animals.

Normal coyotes need seldom be feared by

man. Only once have I heard of them attacking a human being. One of the ranchmen at the Whitewater Ranch on the Colorado Desert was irrigating one evening and was approached by a small pack of lean, hungry-looking coyotes. They dogged his steps and menacingly tried to snap at him. He was able to keep them off and finally to drive them away only by throwing water from the ditch upon them with his shovel.

Though coyotes are more or less sociable animals among themselves, there are seldom more than two or three together, though their rollicking, yelping barks would lead one to think two dozen were coming near. Their voices often have a peculiar human sound about them, so that one might easily imagine their cries to be those coming from a group of playful, yelling youngsters. I well remember an old lady, who had spent all her life in Chicago, exclaiming when she first heard the coyotes barking, "Where are all those noisy bad boys?"

THE BATTLE OF THE REPTILES

THE BATTLE OF THE REPTILES

I VIVIDLY remember the well-meaning lady who, after listening for two months to a course of lectures on Natural History at one of our summer resorts, exclaimed, by way of showing her interest and appreciation of the lecturer: "How I would like to go out an hour with you some time and see all these things you have told us about!"

All in an hour! As if the world of out-of-doors was a great cinema film, and all one had to do was to take a walk with a naturalist and see the whole interesting performance reeled off the screen in an hour!

Nature is in no hurry to make show of herself. She works slowly, often infinitely slowly, and the poor misguided souls who are of that same mind as Kipling's monkeys, who wanted to know and do all things "complete in a minute or two," must ever remain disappointed with Nature's deliberation and seeming procrastination.

"Gold," said an old prospector, when asked by an inquisitor where one might locate it, "is where you find it; that's where it is." And so one must say of the interesting phenomena and incidents of Nature's programme. Sometimes one must travel for hours or even days before seeing anything unusual. Then again there will come days which seem crowded with spectacular and interesting sights; as though Dame Nature had turned generous, and hurried the events of the weeks into a single day. But whichever way the tide turns, the nature-lover is content, knowing that what does not come to him to-day will come on another. If he watches long enough, he will always see something worth his while.

On the evening when first I saw the mason bees at work, I said to myself while going home: "This is plunder sufficient for any day." You may imagine my mingled surprise and delight when there was staged before my eyes, in addition, the unusual reptilian battle described in this sketch.

The sun had already been down half an hour and the lingering reflected rays of daylight

were just about to flee, when, in the dusky light, I saw beside my path a ball as peculiar as ever eyes had seen. There on the ground was a brilliantly colored king snake wound up into a ball as tight and as intricately turned as a Gilligan hitch. Protruding between the coils in all sorts of most awkward, absurd, and outlandish positions were the four legs of a large gridiron-tailed lizard (*Callisaurus ventralis*). That expression, "closed in mortal combat," could never be used more appropriately than to describe these creatures wrapped together into this reptilian knot. The snake had wound himself about the saurian's body in such fashion that it seemed as though every bone in that lizard's body must be broken, the vertebræ pulled apart, and the function of every vital organ suppressed. The body was doubled backwards so that the rump and head were touching. So intent was the snake in his efforts to bind in tighter the already over-squeezed lizard that he seemed not to notice my presence in the least, or even be disturbed when I turned the living knot over with a stick.

As the writhing ball was turned, I noticed

that the lizard, who looked as though he had been dead for some time, had his jaws closed upon a fold of the snake's skin near the neck. "This," I said, "is because *rigor mortis* has set in and the jaws which had snapped in self-defense when the snake attacked are now set stiff in death. It's good enough for you, old snake. For once the biter has been bitten."

There was not the least motion in the lizard's limbs; there was no doubt in my mind but that all circulation of blood had long ago been cut off by the constrictions of the snake's lithe body. As though attempting to begin swallowing the lizard, the snake was now trying this way and that to close his jaws over the saurian's head, but, since the lizard also had the snake within its jaw-grip, the latter could get no hold of any kind.

Inasmuch as the darkness of night was coming on so rapidly that I feared I would not be able to see the end of this interesting struggle, and since my sympathies were decidedly against the reptile who had so hard-heartedly caught this poor lizard, I decided before leaving to untie this reptilian Gordian knot and deprive

the snake of his cruelly gotten prey. With the aid of two sticks this was effected; but not without some difficulty, for the snake had given the lizard a double wrap besides tying his own body into a classical single knot.

You may imagine what was presently my surprise when I saw this lizard, now unwound, and whom I had thought long ago dead, quick as a flash spring backwards, and, righting himself, dash at the snake and grasp him again just behind the head.

Talk about being game; here was no coward of any stripe. He leaped literally from the coils of death back into the struggle. And he held onto his opponent as tenaciously as a snapping turtle. Though the snake now did his best to get away — he doubtless had had quite enough of it — the lizard held on with his iron grip and even allowed himself to be dragged along by his foe, who was now making his way toward a near-by hole beneath the surface. Not to be daunted when even this narrow opening was entered, he permitted the snake to draw him beneath the surface. When nothing but the zebra-striped tail was protruding above the

opening of the burrow, I grasped it and pulled the lizard off, allowing the snake to go free. My opinions were now changing, and I began to judge that the lizard might have been quite as much the aggressor as the snake. After I pulled the lizard away, he ran off a little to one side and, tilting his head upward, looked at me saucily and reproachfully, as much as to say, "Well, what business do *you* have around here to meddle in my affairs, anyway?"

"Scat," I said, "you ungrateful beast!" And he scurried off into the brush to rest and ease up as best he could his much-stretched limbs.

And of course you ask: "What happened to the snake?" And my only answer can be that he crawled on down a hole; and he did it in a hurry, too.

Since this occurred I have often speculated as to how this battle between the reptiles began. It no doubt would have been an interesting thing to have witnessed the struggle from beginning to end; for it would have given one such a realistic picture of those struggles and scenes of carnage which in ancient geologic times were

staged between the huge carnivorous dinosaurs and the massive, heavily armored, herbivorous, monitor-like reptiles.

If you ask me to venture a guess as to who would have been the victor in this struggle, I will say, the snake, for he had every advantage. It is common knowledge among old desert travelers that the larger snakes quite generally attack and eat lizards, especially the smaller ones; also that the larger lizards prey upon the more diminutive species, and that snakes eat snakes. Mr. Gilman tells me that recently he witnessed in his own yard at Banning, California, a red racer devouring a black rattlesnake. A young observer from Barstow on the Mohave Desert has just sent me this interesting experience:

“As I was coming out of our well, that is, the pit in which the pump is, I came face to face with a huge gopher snake which was eating a medium-sized lizard. The reptile was about half swallowed. I watched them for some time, but as neither moved and I was in a hurry I touched the snake with a stick. He immediately opened his mouth and spewed the lizard out.

The lizard's forelegs were folded tightly against his sides and he appeared to be dead, but in a few minutes he opened his eyes, tried first one leg, then another; and then on seeing me *he ran off at top speed*. I was truly surprised, for I did not think that anything could go through the experience of being half eaten and still live, much less be able to run off immediately afterwards."

THE PHAINOPEPLA

THE PHAINOPEPLA

(*Phainopepla nitens*)

WHAT memories of lovely desert spring days the name of this bird awakens! One can hardly recall a walk then taken when one or more of these stately bird sentinels were not seen gracing the topmost twigs of some mesquite tree. The generic Greek name *phainopepla*, which means "shining coat," was certainly well chosen for this black-feathered aristocrat. To give him an air of dignity beyond that which his elegant form of body furnished him, Nature adorned his head with a magnificent crest and provided that the eye should be a flaming red. On each wing of the male bird there is a clear white wing patch, and when he flies upward the effect of the contrast of color is most wonderful. All these characters give this bird an individuality which is very marked and he becomes to us one of the easiest of birds to identify. The female phainopepla, like the female Brewer blackbird, lacks somewhat the beauty of her

mate in that her coat is only a deep brownish gray color and the wing patch is but a dull white.

The phainopeplas are characteristic birds of the Lower Sonoran Life-Zone of all our Southwestern deserts. Some individuals, it is true, occasionally stray outward to the coast during the spring to nest in the sycamores and to eat the scarlet pepper berries, but the majority of them remain the year round in the mesquite thickets and juniper mesas of the deserts.

So close is the relation, on the Colorado Desert, between the phainopeplas and the mesquite tree that it may be safely stated that the distribution of this bird there is coextensive with that of the mesquites. Where there are no mesquites you will find no phainopeplas. In the branches of these trees grow the great clumps of the mistletoe (*Phoradendron californica*) which bears those beautiful pink and pearly berries of which the phainopeplas are so fond. During parts of the year they seem to live almost exclusively upon them. In the early spring the inconspicuous blossoms of the mistletoe attract myriads of insects and on these the birds gorge to fatness.



A DESERT CAÑON

SUCH PLACES AFFORD PROTECTION TO MANY OF THE DESERT ANIMALS DURING THE HEAT OF SUMMER

It is the most natural thing that the phainopeplas would choose as sites for their nests these trees where they find so much of their food. Generally the bird-home is built on a horizontal branch of a mesquite tree just under the mistletoe clump, where it will be well screened from the eye of gazers by the myriads of down-hanging, blossoming stems. The rather small nest in many ways resembles that of the wood pewee. It is made entirely of fine materials bound together with pieces of spider web and is lined with wool from tomentose plants found in the vicinity. The eggs are an ashy-blue color, thickly covered with bluish and black spots, and generally number two to the nest: occasionally there are three. The question here arises: Why so few eggs? Reasoning by inference it may be said that it is probably because the phainopeplas have few natural enemies. Generally Nature provides that animals with many natural enemies should rear many young. Thus the quail which nests on the ground lays from eight to fourteen eggs for each setting. The almost universally hunted hares are very prolific. But the band-tailed

pigeons, which build their nests high and roost in the trees, lay but one egg.

The phainopeplas which remain throughout the year on the desert breed much earlier than those which nest nearer the coast. In such locations as Banning and Beaumont, California, which are close to the desert, and yet high enough to have a later season, the desert-reared young are often found sporting among the trees when the adults which have come to the higher zones to nest are just beginning to incubate their eggs.

The male phainopepla is a very helpful mate, always taking a very conspicuous part in constructing the nest and rearing the young; indeed, he often does the major part of the work, the female only passively showing her interest by sitting on some twig close by and looking on approvingly. Instances are recorded in which the male, having lost his mate through some mishap, took entire charge of the nestlings and brought them up until they were able to care for themselves.

Sometimes phainopeplas consort in small flocks, but most often you see individuals

perched solitarily like shrikes on the tips of high mesquite twigs where the situation offers a good lookout. Like the shrikes, too, they have a way of occupying such positions for unusually long periods. There they sit often for a quarter of an hour at a time preening their feathers and stretching their wings, otherwise remaining almost motionless and in silence except as at frequent intervals they repeat their mellow flutelike whistle.

This call note is a simple one, but not without character; for, like the phœbe's melancholy and plaintive note, it has a pleasing and soothing quality which admirably harmonizes with the quiet beauty of the landscape. During the nesting season this simple note is supplemented by a subdued but rich warble that has many elements of real music.

My many observations of this silky-plumaged bird lead me to believe that he is almost as good an insect catcher as the phœbe. True, he is not so diligent a worker, but when he sallies forth from his perch and snaps at a fly he seldom misses it. His habit of often returning to the twig from which he has darted reminds one

strongly of the ways of the flycatchers. This similarity of habit early gave the phainopepla the common name of "black-crested flycatcher," but since this appellation is misleading, its use has been discouraged by ornithologists.

LATRODECTUS, THE POISONOUS

LATRODECTUS, THE POISONOUS

(*Latrodectus mactans*)

OF all the spiders feared by man to-day few have the black reputation of those belonging to the genus *Latrodectus*. The much-feared malmignatte of southern Europe, the dreaded karakurte of southeastern Russia, the kapito of New Zealand, the vancoho of Madagascar, and our own American black widow are all spiders of this genus. The American *Latrodectus* is quite generally known on sight by the Southwestern Indians, especially the older ones; for it was long the practice among these people to use these spiders, crushed, for poisoning their arrow-points; but I am convinced that not nine out of ten of the white people who need to fear this noxious spider would know her if they saw her, and this in spite of the fact that she is one of our commonest Southwestern spiders.

Latrodectus is one of our few spiders with a purely black body. So black is it that often it

shines like blackest satin and under certain lights even has a greenish cast. The red spots so much talked of in connection with this spider, and which are necessary marks for her identification, are found on the *underside of the abdomen*. These are not always red, but are quite as often only buff or a light corn color, a fact well to keep in mind. They are in the shape of two triangles set apex to apex and resemble together an old-fashioned hour-glass; hence the vernacular name for the species, "hour-glass spider." Sometimes on the back of the spider there is a broken row of red dots running down the middle of the back. The male spider, who is also black, has, besides the red markings, four pairs of red stripes running down the sides of the abdomen. The female *Latrodectus* is a comparatively large spider with an abdomen often fully as large as a gooseberry or a large shoe button. The Widow's husband is much smaller, generally only about one fourth as large as his mate; he is seldom seen.

In accordance with her rapacious nature this spider exhibits few æsthetic tastes in the building of her web. It is an unshapely and unbeauti-

ful piece of construction, made of threads exceedingly coarse; in fact so coarse that one may detect the presence of the black widow by her web alone. No set pattern is used in its making; a few silken strands which she has run criss-cross with a more or less carelessly made funnel-shaped, more closely woven retreat, built in some dark corner, is all there is to the crude structure.

When egg-laying time comes a small, globular, closely woven, rather hard, silken sack is made, filled with tiny eggs and suspended by several threads to the main web. Owing to the collection of dust it is often a dirty white color. The eggs soon hatch after being laid, but the young do not necessarily emerge just then. Sometimes they remain within the egg case many days and moult before coming out; further, they always wait for a sunny day to come before showing themselves. They are at first a light yellowish gray color, but after a number of moults turn black like the parents. Unlike the young lycosid spiders, who cling to the mother and ride about for some time on her back and legs, the young black widows show

their independence as soon as they are out of the egg case. Both eggs and young may be found in the Southwestern States at almost any time of the year.

The poison of this venomous spider is secreted in two pouchlike glands covered with spirally arranged muscles. These glands are located at the extreme front end of the head, and from them run tiny ducts to the pores at the ends of the claws of the mandibles. The pore is located not at the point of the claw, where it would become closed or plugged by the flesh of the victim, but on one side, allowing the venom to run freely after the puncture has been made by the sharp end of the mandible. This opening of the venom duct may be seen with the naked eye on the mandible of such large spiders as the black tarantulas.

When a human being is bitten there is little to show where the puncture has been made — no little red spot as is often thought. Since the poison is one of the most virulent known to medical science, the symptoms following a bite are quite serious, especially if the victim is a small child or a person in frail health. In such cases

death may ensue. In most cases, however, the patient recovers after a few days of torture. According to temperament and other conditions which may prevail, different persons are affected differently. There are two types of symptoms following the bite: the nervous and the muscular.

Dr. John C. King, of Banning, California, who has treated an unusual number of patients suffering from this spider's bite, in a paper recently read before his medical society, speaks of the severity of the nervous symptoms as follows:

"The pain is excruciating, often requiring morphia. It is the type of pain we meet in severe cases of neuritis and angina pectoris. It travels from the part bitten, regardless of situation, toward the heart. The patients often lose self-control, weep, cry out, and become difficult to manage. The nervous symptoms, as pain, twitching, insomnia, and nervous prostration, sometimes continue for weeks. I have treated bites inflicted by tarantulas and stings given by scorpions, but in no such instance has the pain compared with that following this

small spider's bite, nor have the nervous symptoms been so marked.

"Personally I prefer the bite of a rattler."

In some cases the bite of *Latrodectus* is followed by extreme tightening of the abdominal muscles, few of the nervous symptoms then being present. All of the abdominal muscles, especially the short muscles of the hips, become exceedingly rigid and the pain accompanying this tonic spasm is intense. The pain subsides after about forty-eight hours and no after effects are noticed. The poison never seems to affect the heart.

Though this spider is much feared by the Indians, it is now known that, at least to some extent, the venom was formerly used by them as a cure for acute and chronic rheumatism and a number of other ailments. A medicine man at Cahuilla, Riverside County, California, who used this remedy, prepared his patient for the bite by a fast of two days and then allowed the spider to bite the sufferer on the hand. The patients who took this heroic treatment became very sick, but were said to be free afterwards from their old ailment. The case of a white

settler who took the treatment from the Cahuillan medicine man, and was cured, came to my attention just recently.

The black widow, or hour-glass spider, is widely distributed in the United States, being found, according to Emerton, "all over the United States as far north as New Hampshire and south through Florida, the West Indies, and Chili." It is very plentiful in Southern California. In spite of its frequency, few people are bitten. The spiders seldom bite unless severely provoked. In almost every case of which I can find authentic record, the persons bitten were those living in country districts and the bite was experienced while about out-of-door toilets or barns where these spiders resort to spin their webs across openings and in dark corners.

THE LE CONTE THRASHER

THE LE CONTE THRASHER

(*Toxostoma lecontei*)

"If you want to see a bird that can' *run*, you must watch for the little brownish bird that's got a long sickle bill," said Charlie, my cowboy friend, with whom I had been talking about the fleet-footedness of the comical road-runner. "They's a bird that can *really* run. They's the greatest dodgers and runners and hidlers you ever did see. There's only one way you can ever catch one that I ever seen, and that is, by chasing them down on horseback. But it's risky business trying to get one that way, that's what I know. Suppose your horse tumbles in a badger hole when you're chasing your bird at breakneck speed and you go headlong into a bunch of that awful cholla, then what would you say? It's no fun then, that's sure. I knowed a feller once, a cowman, over on the Whitewater, who had just that thing happen to him. He saw one of them birds, and just for fun, he said he'd show us boys how to get

him. He started out full gallop after him and chased the bird from one bush into another. But that bird was such a good runner and got under the bushes so quick every time, that he kept that cowman guessin' all the time where he was. Of course no bird can keep on runnin' and dodgin' forever, and soon he got so tired out he could n't hardly go no further. Just when that cowman thought he had his bird, what should his horse do but step into a badger's hole while going full gait, and throw that old man right into a cholla. Oh, but he was a sight! All stuck up with dozens of prickly cholla joints, and it hurt so bad that when we came up to help pull 'em out he just yelled and cried like a little boy. From head to foot his clothes were pinned to his skin. That feller don't go bird-huntin' and chasin' no more; no, no more. He says that birds can run in the bushes forever and never get bothered so far as he is concerned."

After hearing this interesting recital of this bird's running abilities from Charlie, I was anxious to get a sight of one. I shall never forget that day when I first saw my Le Conte

thrasher tearing like a fugitive from justice at breakneck speed out of my sight. Almost quicker than my eye could follow him he dashed into a bush, and by the time I reached the spot where I thought he was hidden I saw him speeding a hundred yards away to get under cover of another. Like the road-runner he preferred running to flying and took wing only when hard-pressed by his pursuer. Since his color was so near that of the gray sands and vegetation of his range, he slipped out of sight with the greatest ease. It was a long time before I saw him again. Nowhere is the Le Conte thrasher plentiful, and I watched carefully through many seasons before I really felt I knew this wary bird.

His shyness is of an exaggerated type. He tries always by every possible means to avoid you and with his powers of running and dodging he generally is successful. Collectors tell me that he is one of the most difficult of all birds to shoot and that the only way for the gunner to get him is literally to shoot while on the run.

Though rather rare birds, the Le Conte thrashers are always about in greater numbers

than you are aware of. About the only way to make a census with any proximity to satisfaction is to count the nests of the season. I have traveled for days and have seen but one or two of these thrashers about when I well knew by signs that there were many more in the vicinity.

They generally keep pretty well to the brush-tangled washes where some protection is offered them from intruders. If there is a field of cholla cactus in the vicinity, you may be sure that they have sought it out as the most suitable place for the nest. They will occasionally build in palo verde trees, but the cactuses are always their first choice as building-sites.

The nests are generally inconspicuously placed in the center of the thickly spined, branching tops of the cactuses and consist of rather coarse thorny twigs. They are easily distinguished from the nests of the cactus wrens by their open tops. The inside is generally lined by vegetable wool gathered from a small woolly plant, known as filago.

The female, like most of the thrashers and like the wren-tit of the foothills, is a close sitter, and seldom leaves the nest until the intruder is



NEST OF THE LE CONTE THRASHER

right upon her. And then when she goes she leaves as silently as a mouse with never a word of protest or the faintest cry to show any sign of alarm. She simply slips over the back of the nest and is gone.

Mr. French Gilman, of Banning, California, because of his long residence on the desert and his intelligent interest in birds, is, perhaps, better acquainted with the habits and mannerisms of the Le Conte thrasher than are most Western birdmen. With his permission I am here appending in effect his words concerning the call notes and singing habits in general of this hermit bird:

"My introduction to this interesting bird, *Toxostoma lecontei*, was during the summer of 1882 when with his whistling note he confirmed my earlier belief in ghosts. In a mesquite and creosote bush thicket at Whitewater Ranch on the Colorado Desert was buried a Mexican horsethief who had died with his boots on. Near this thicket I frequently wandered, though it was said to be haunted. On several occasions a whistle sent me to the ranch house to see what was wanted, but when I got there it

was always to find that no one had whistled. This puzzled me until I found the noise came from the thicket, and of course it must be the Mexican ghost. This I believed until, a few days later, accident revealed to me the real whistler, a Le Conte thrasher. The note of the thrasher can be mistaken for that of no other bird. It resembles closely the whistle a man employs in calling a dog — short with rising inflection at the end. So striking is the resemblance that it is nearly impossible to distinguish one from the other. The calls are uttered at intervals of about a minute, when the bird is in the mood, and are easily imitated. If the imitation is accurate, the bird will continue answering for a long time, but care must be taken not to repeat the whistle too rapidly or he sees through the deception. In addition to the call note he has a very attractive song which resembles that of an uneducated mocking-bird, though fuller and richer and pitched in a higher key.

“The only drawback to the song is its infrequency, even when the birds are most abundant. You may be in their midst all day and see sev-

eral pairs, but if one song rewards you it may be counted as a red-letter day. At least this has been my experience of nine years in particular. For some time I doubted the statement made by some writers that the Le Conte thrasher was a fine singer, but I was finally shown by the bird himself. While standing one evening on a high-drifted hill of white sand about two miles west of the rim of the ancient Salton Sea, I heard the sweet strains of a new bird song and began to look for the singer. I expected to find a mocking-bird whose individuality had been developed by the desert solitudes and who had learned a new song. On an adjoining sand-hill, perched on the exposed tip of a sand-buried mesquite, I saw the singer — a Le Conte thrasher. Perhaps environment enhanced the music, for the spot was a most lonesome, forsaken one, near an ancient Indian encampment and burial-ground, but I have heard no sweeter bird song and the memory still lingers. Since then I have heard the song a few times, but not oftener than once or twice a year, though I have frequently been among the birds. Not only do they seldom sing, but the whistling call note is

not often heard. They appear to be silent, unsociable creatures, never more than a pair being found together, unless a brood of young birds and parents, and then only until the former can shift for themselves."

THE GNATCATCHERS AND VERDINS

THE GNATCATCHERS AND VERDINS

(*Polioptila plumbea* and *Auriparus flaviceps*)

THE plumbeous (lead-colored) gnatcatchers, though not the smallest of the desert bird pygmies, are surely its noisiest scolders. Their raspish song, anything but musical, is uttered with such frequency and in such a determined and defiant tone that it always sounds as if these midget birds were berating and throwing challenges to everybody in the neighborhood.

With never a minute for idleness they go working their way from bush to bush, turning this way and that, their restless tails all the time wagging in unison with their fidgety bodies. They hunt in pairs; one, generally the male, takes the lead and the other follows close by. As they move rapidly about, scolding and chattering and scanning the bushes for insect eggs, small caterpillars, and beetles, they remind us of those talkative and active mountain birds, the chickadees, except in that they are not quite so adept as the chickadees at

turning upside down on the branches. Evidently they always have a great deal to talk over among themselves about the adventures of the day, for they are never still a minute. I have known them to utter four different notes in half as many minutes, each with its peculiar variations and distinct individuality and doubtless the expression of strong emotional states.

This afternoon, while walking under a large palo verde tree, I found a gnatcatcher cleaning mites from his feathered coat. Judged by his motions, he had plenty of them. With a bewildering rapidity of movement, he spread his wings outward and backward and brushed them over the top of his tail, and then bill-scratched his breast and underparts. Hardly had he begun this before he was scratching his neck and head parts with his feet. This billing and scratching and brushing were kept up fully fifteen minutes with scarcely a minute for rest. So much occupied was his mind with his task that he barely noticed my presence at all.

It is always interesting to catch birds at such odd times when they are doing little things like this, for one then gets a peep into a side

of their lives which helps much in interpreting their real nature. This little fellow's problem was very real to him, as was shown by the vigor with which he attacked its solving. A sparrow having the same difficulties would doubtless have taken care of them in quite a different manner.

The plumbeous gnatcatchers have a geographical range that is very definitely defined. They are found more or less all the year throughout the deserts of southeastern California, but particularly in the Lower Sonoran Life-Zone of the Colorado Desert as far west as the San Gorgonio Pass region, where they are displaced by the western and black-tailed gnatcatchers. The plumbeous gnatcatchers are very jealous of the territory which Nature has allotted them, and with zeal they guard it against all encroachments on the part of the western and black-tailed species. Occasionally one will see a pair of black-tails on plumbeous territory, but the trespassers are few, for they receive rough handling and are hustled out of the region in a hurry. This is especially true at nesting-time. Both species of gnatcatchers are good scrappers,

and it is always an exciting time when they meet at the cross-trails and settle their disputes in beaky arguments. They are always noisy birds, but at such times a pandemonium of screechy, quarrelsome bird notes is set loose upon the air. The plumbeous is generally the aggressor and he drives out his rival at any cost of feathers.

This pugnaciousness of the plumbeous gnatcatcher is manifest toward all birds when the occasion arises to protect his rights. Woe be to the bird, even though he be a large one, that shows himself too familiar and aggressive a visitor in the mesquite and cat's-claw bushes where the plumbeous gnatcatchers have built their nest.

There is another tiny bird, the verdin, which lives in the same region and which is of the same small size, nervous temperament, and restlessness as the gnatcatcher. There are good chances that the novice will confuse the two birds unless some attention is given to learning the field marks which distinguish them. Both are birds with grayish or lead-colored backs and fluffy, lighter underparts. The male ver-

dins, with their bright olive-green crowns and yellow heads, need never be mistaken for any dull-colored gnatcatcher; but the female verdin is not so easily distinguished. The yellow and green of her coat is restricted to two small patches, one on the head and one on the neck just beneath the bill, and the colors are almost always of so dull a hue as to be hardly seen when the bird is in motion.

A good time to become familiar with the verdins is during the breeding-season; for you will then learn to associate them with the large retort-shaped nests which they place in the wild lavender, mesquite, and other thorny bushes, and you will see both male and female together, making it possible to compare their markings. Without making any protest or appearing much disturbed, the birds will let you sit for hours under the nest while they come and go about their business.

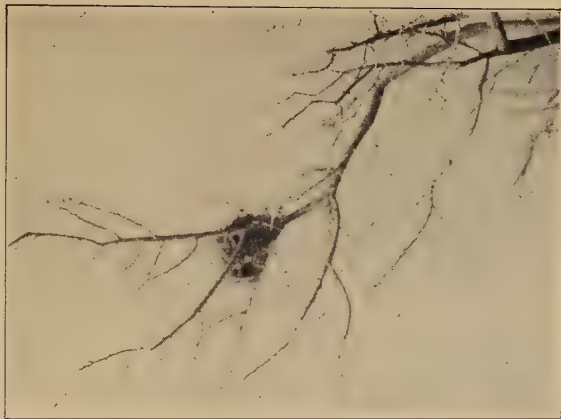
The nests are always easy to locate, for they are large and conspicuous. Those that I have found on the Colorado Desert were almost always located in the upper crotches of the desert lavender bushes which grow so plenti-

fully along the gravelly washes and in the cañon bottoms. On the Mohave Desert, where the *Hyptis* (the correct name for the so-called wild lavender) does not grow so plentifully, the nests are placed in the mesquite and cat's-claw bushes. There are generally two nests built very close together or in the same bush. This pairing of nests is easy to account for when we learn that the verdins, like the cañon wrens, build roosting- as well as breeding-nests. The larger nest is the one built and occupied by the female for nesting-purposes, while the smaller is built by the male and is for his sole use as sleeping-quarters. After the young have been reared, the female uses her nest for the same purpose. If you have any doubt concerning the occupancy of the nests at night, just gently thrust your finger into the hole at the end of the bird-home some evening or early morning, and feel what a peck you will get from the tiny bird tenant inside.

The verdins' appreciation of economy has induced them whenever possible to utilize the material of old nests in the reconstruction of new ones. Last winter I took down an unoccu-



YOUNG LE CONTE THRASHER



NEST OF THE VERDIN IN A CAT'S-
CLAW BUSH
THE ENTRANCE IS SEEN AT THE LEFT

spied nest of the season and placed it up under the eaves of my house where it served as a decorative feature. When spring came the verdins (evidently the same pair that had built it in the spring of the year before) spied it out and proceeded without my permission to tear it to pieces bit by bit and make it into a new home for themselves. As though it were a kind of protest against my ever having removed it from its old place in the lavender bush, they took every twig of it back there and made the nest in the same branch from which I had taken it. When this nest was done, it was almost as big as my head. So many feathers and leaves were put inside for lining that one would have thought there would have been no room for anything else; indeed, so many feathers were protruding from the small opening at the end that the fat nest looked as if it were going to burst. If any baby birds that afterwards occupied it were not comfortable, it was because they had crowded quarters and not because their bed was not soft enough.

When I came back to the desert in the autumn I found these same birds still holding

possession of this nest and the roosting-nest built beside it soon after. They were then getting ready for winter and were thoroughly renovating and relining their old domiciles of spring. Frequent trips were made to a gully several hundred yards away, and there from some source — I venture to say from some old nest — great numbers of feathers and sticks were secured. By utilizing old material the birds were able to save themselves much labor and were able to reconstruct the nests in a remarkably short time. As far as I could see, the remade nests looked as good as the new ones made from fresh materials in the spring season.

Generally but one bird was about working at a time. When bringing in material the female verdin always hesitatingly paused a moment underneath a twig just beneath the nest before going inside. Having gone in and fixed in its proper place the stick or feather she had secured, she flew to a twig which was near by and spent a second or two boasting of her accomplishment in chippering song.

THE DESERT LYNX

THE DESERT LYNX

(*Lynx eremicus*)

WILD CATS or desert lynxes are plentifully found over almost the whole desert region of the Southwest. They are especially abundant along the western borders of the desert, where the brushy foothills of the high mountain ranges afford them abundant shelter and a good supply of food. They are such shy and secretive animals that were it not for their occasional depredations upon the fowl yards of settlers, and their getting into traps set for them by trappers, we should scarcely ever know they were about. They are out very little in the daytime, preferring to do their hunting during the early evening and night hours. I was, some months ago, camping near a water-hole on the Colorado Desert, and every evening at dusk I observed a mother lynx coming down onto the little grass plot near the spring. As long as I was perfectly quiet, she would sit still and watch me, but the moment I made a sudden move she

was off into the arrowweed in an instant. By following her trails, I was led into a rocky gorge near by where I found her den, and in it were three kittens about one third grown. I must confess that, when I first approached, it was with much hesitancy, for a wild cat is not a pleasant animal to meet in combat. And here was a mother with young! To my surprise she became frightened and abandoned the den almost as soon as she saw me, and I was left to see the kittens alone. They were pretty little things, really much more like domestic kittens than I had imagined. There was a stockiness of build, a bigness of head, and enormity of padded paws, however, that no tame kitten ever possessed. Furthermore, there was no long tail — only a stump; the jowl whiskers, if such you may call the heavy long hair-tufts beneath the jaw, were well developed, and the ears were tufted by fine pencils of black hair. As I approached the kittens they gave a coarse “mew,” but very soon showed their distrust by spitting at me. They were going to take no chance with this new creature who had looked down upon them in their home,

and they leaped from the nest and past me into the open with a quickness that startled me. There was probably a family reunion somewhere out in the brush that night, but I never had a chance to know of it, for the mother never led her kittens back to the old den again. One such intrusion was enough for her.

The young begin eating meat without evil consequences very early, probably within a few weeks after birth. Small animals and birds are brought in, torn to pieces by the mother, and fed to them. Growth under these circumstances is very rapid, and it is not long before the young cats are able to hunt for themselves. Like the domestic kittens they are very playful and when taken soon after birth manifest a great affection for their captor if he is at all kind to them. They will not tolerate strangers, however, and will spit and jump about ferociously in the cage and show the greatest of uneasiness.

Wild cats manifest the greatest antipathy to their domestic cousins; also toward dogs. A man whom I met at the head of Coyote Cañon, in Riverside County, California, found

it necessary to keep the closest watch on his tame cat, especially at night. To ensure her a safe retreat he had a hole cut in the door of his house just large enough for her to pass through, but too small for the lynxes. The dog when annoyed sought shelter up in the attic of the small shanty, a crude stairway leading up to the door outside affording him a means of getting up. This man had lost several cats in the past and his small dog had had enough scratches to make him scramble upstairs to the attic upon the first good hiss from a wild cat.

At Indian Springs Ranch, in Southwestern Nevada, a desert lynx had a few days before my arrival played havoc with a whole flock of domestic fowls, killing in all some twenty blooded chickens — and this in one night. The animal had been crawling over the roof of the rather poorly constructed coop and unluckily fell through the rotted shingles plump into the midst of the whole pen of roosting fowls. Frightened, no doubt, and angry because he could not find his way out, he killed every hen within reach. The proprietor of the ranch found him still imprisoned next morning, and a

wild-cat hide now lies stretched on the floor of the house.

Lynxes live largely on birds and such small mammals as they can overpower. These they catch by approaching them stealthily and then at the opportune moment leaping upon them. Fowls are taken occasionally, but no one need lose chickens if he will see to it that the pens are tight and strongly made.

THE DESERT WHITE-CROWNED
SPARROW

THE DESERT WHITE-CROWNED SPARROW

(*Zonotrichia leucophrys intermedia*)

OCTOBER 15. Now that the desert white-crowns have returned, and we hear their earnest and cheerful songs from almost every weed and brush tangle, we know that autumn days have come for good. With the arrival of the warm spring days they left us, and all summer they have been foraging in far Northern meadows and busying themselves with the important work of rearing families. Since these nursery duties are over, they are glad to be back again to the warm desert lowlands, even though for a little while they must be content with the scant fare that is left for them. Scarcely anything has been growing all summer and the small crop of seeds which ripened in early spring has largely been buried by the winds or picked up by the resident birds before the flocks of white-crowns and chipping sparrows arrived.

The desert sparrows seem to know that if

they are going to get anything to eat they must earn it by their own diligent efforts. In little groups they sally from one weed patch to another, and industriously scratch for every mite of food that is left. They seem to spend a good deal less time than most of the birds in aimless flights or in sitting around in the sunshine doing nothing. Like the European peasants they sing as they work and pass the days merrily even though they must be filled with arduous labors.

The music of these gleeful birds is the cheeriest and most constant song of winter and lends brightness to many a dull and monotonous day. They are particularly songful in the evening at about the time when they are going to roost.

Unhappily there is little of particular interest to write about these birds for, while they are well worth knowing and always are about in greatest numbers, they belong to those generalized types of birds with few mannerisms that are noticeably unusual. Perhaps we may say of them, as Lincoln said of the common people: the Lord must love them because he made so many of them.

THE BLACK-TAILED HARE

THE BLACK-TAILED HARE

(*Lepus californicus deserticola*)

AMONG the smaller animal folk of the arid Southwest, the black-tailed hare or desert jack rabbit, is the paragon of racers. His only rival is the desert sand-lapper, that swift-footed lizard that seems to run over ground as birds fly through air. The coyote often attempts to outrun the hare and sometimes overtakes him, but more often this green-eyed rogue catches his "jack" through strategy rather than by mere swiftness of foot. The coyote is wise and sagacious enough to know that if two of his kind will coöperate in the hunt they can take advantage of the rabbit's tacking habits and get him without long chases. The first one chases up the hare, and the second places himself in such a position that when the rabbit changes his course he runs square into the jaws of the waiting coyote.

Yesterday, while out with the donkeys to visit an old Indian cave, I was suddenly startled

by a jack rabbit who ran across the trail. His eyes were wild with terror. Hardly had he passed when hot upon his heels came a murder-bent coyote with greedy jaws gaping wide ready to grasp his victim. So close was he on the chase that the two or three forward steps which I took, between the time I saw the rabbit and noticed the coyote, placed me between the two, and the coyote found it difficult to stop short enough to prevent himself from dashing right into me. As it was, he stumbled and almost threw himself over backwards in the efforts to slacken his pace. As soon as he recovered himself, he sneakingly ran off to one side, sat down on his tail, and, with his tongue hanging from between his panting jaws, divided his attention between me and the escaping rabbit, looking first reproachfully and scornfully at me and then curiously, longingly, and with comical regret at his departing dinner. He was, no doubt, wondering, like men who have suddenly lost long-sought fortunes, how it had all happened so quickly. The rabbit was fully aware of his new chance for life and made away as fast as his strong, lanky limbs would

carry him. Had I not been there and intercepted the coyote, another instant would have witnessed the poor rabbit being torn to shreds by those cruel canine teeth.

I have often wondered how it would seem to be thus called upon to flee for one's life at a moment's notice with the unhappy and horrible prospect of being eaten alive if one's prowess as a runner was not equal to the exigency. There is no doubt but that not only rabbits but nearly all smaller mammals are almost daily called upon to meet just such issues. How hard their lot must be in comparison with that of the super-mammal, man, who through his wisdom and invention has found almost complete freedom from such dangers! Rabbits seem to have about the hardest lot of all the small mammals that roam the fields; for the number of their natural enemies is almost legion. Owls, hawks, snakes, coyotes, wild cats, golden eagles, and man, all crave their tender flesh and thirst for their sweet, warm blood; and were it not for the extraordinary fecundity of these rodents they would long ago have become extinct. Nature, solicitous for the rabbits' preservation, or else

desirous that her other wild children should have plenty of sport and good food, has decreed that there should always be many young to replace the old ones who have fallen prey to the gunners, rapacious birds and beasts.

This long-eared rodent of our sketch is exceptionally easy to distinguish from other rabbits of his range by the black tail which he carries appressed against his rump. His light weight, thin body, and exceptionally long legs are characters which separate him from the short-bodied bunnies or cottontails.

When he is hopping about feeding or traveling at ordinary speeds, the long membraneous ears are carried erect, but when the hare is traveling at high speed the air pressure induced forces them to lie back. The black-tailed rabbit evidently realizes what conspicuous appendages his jet-tipped ears are, and when trying to conceal himself in the open he crouches low on the sand and lays the ears well back. As soon as he thinks it safe he gets into the brush, rises up on his haunches, and without fear of detection erects his ears and tests every wave of sound that comes his way.

These rabbits are out foraging both during the day and at night, but they are the more active in the dark. Much of the time during the day they remain hidden in pocket-like shelters made in the brush. These "forms," as they are called, are about the rabbits' only protection against bad weather, and were it not for their heavy, furry winter coats they would spend many days in discomfort. The cottontails are wise enough to seek shelter in holes.

When the rabbits go foraging, they are not fastidious eaters. The bitter-barked creosote bush and the Bigelow's cactus are among the few plants of the desert immune from their attack. Practically all other trees, shrubs, and herbs are subject to their nibbles. Even the greater number of cactuses with their sharp spines are robbed of their juicy outer parts. Barrel cactuses, those spine-protected natural reservoirs of the desert, are especially sought out. How the tender rabbit noses are able with impunity to be thrust in between the rigid, thick-set spines is a mystery that is still to be explained. I have often found on the dry, rocky mesas, great numbers of the bisnagas, or barrel

cactuses, completely girdled, the pulp-meat having been gouged out an inch or more deep all around. Around the base of each was a ring of excreta, leaving no doubt as to who the nibblers were. The desert rabbits seldom drink, but depend almost wholly for water on such foods. During the summer months their body excretions are reduced to the lowest minimum, and even though they can get to succulent food supplies only occasionally, they suffer little from thirst. A rabbit never perspires in the ordinary sense of the term in so far as I can learn. The sweat glands which function actively are very few and are probably confined to small areas of the skin.

The young come in April or May — born with eyes wide open and with bodies well clothed with hair. No days of helplessness are waiting for them. They stand ready to be off almost as soon as they see the world. Within a few weeks after birth these little fellows are showing much independence, getting around at a lively clip and indiscreetly giving hostages to fortune by exposing themselves to every enemy that may lie in wait for them.

At times rabbits become so plentiful that they are seen almost everywhere in the open country, and then after this there may come years when they seem to have in large part disappeared. Many old prospectors and ranchmen will tell you that this is because food is scarce and that the rabbits have gone to better feeding-grounds. This is an error. While food deficiency may have something to do with the ability of great numbers of rabbits to subsist in any region, yet their scarcity at certain periods cannot be accounted for wholly on this basis. These rodents are subject to several contagious maladies which at times so reduce their numbers that it would seem there were scarcely enough healthy ones left to replenish their kind. But those that survive manage to repopulate the fields in a remarkably short time, and the ranchers are all too soon complaining about "too many jack rabbits" again.

The water blisters often found on hares are due to the presence of the larval form of a tapeworm. The late Dr. Katherine Brandegee worked out the life-history of this parasite, and I give her words concerning it:

"Swellings known to hunters as 'water boils' are found in a very considerable proportion of hares. So far as I have observed, they do not occur in the smaller species, the brush rabbit and the cottontail, of which I have examined several hundred specimens. . . .

"Tapeworms are exceedingly common, most animals harboring one or more, either in the perfect or larval state, but they are rare in the reptiles. Their life-history is tolerably well known; those which belong properly to the carnivora pass their larval stage in the flesh of some herbivorous animal which is the natural prey to its future host.

"The natural hosts of the *cœnurus* [tapeworm] of the hare are probably the dog and the wolf. A hare badly infested with *cœnurus* becomes swollen and deformed, and as the loins and thighs are attacked by preference his powers of locomotion are seriously impaired. In this condition he falls an easy prey to his hereditary foe, the coyote.

"The coyote swallows not only the hare, but its ten thousand contained larvæ, a circumstance which would undoubtedly give his victim a

feeling of malicious joy, if he were in a condition to know anything at all about it. The larvæ are set free in the stomach of the coyote by digestion of the vesicle that surrounds them, and a certain proportion succeed in attaching themselves by their hooks and suckers to the walls of the small intestine; fortunately only a very small proportion. Their way is beset with dangers, and their extraordinary fecundity is calculated in proportion to their chances of safety. The tapeworm is a colony of hermaphrodites, each joint of which is a sexually complete animal, male and female, containing thousands of eggs. It reaches maturity in about six weeks, after which period the lower joints, and numerous free eggs, are discharged at each evacuation and deposited upon the ground, weeds, or grass.

“The eggs are so small as to be quite invisible to the unaided eye, and being furnished with a thick envelope have considerable tenacity of life. The hare swallows the eggs, either by feeding upon the grass and weeds or by drinking from pools of water into which they have been washed. In the stomach the thick

envelope is digested, the contained embryo is set free, and immediately starts for its predestined resting-place. This microscopic embryo is furnished with six hooklets by means of which it penetrates the walls of the intestine and embeds itself in the muscular tissue. Here it ceases to move, its hooklets fall off, and it slowly develops into a polycephalos [many-headed] vesicle." ¹

¹ *Zoe*, vol. I.



CALLISAURUS, THE GRIDIRON-TAILED
LIZARD

CALLISAURUS, THE GRIDIRON-TAILED LIZARD

(*Callisaurus ventralis*)

"SPEEDING like greased lightning" is hardly a figurative expression when applied to that active and agile saurian, the gridiron-tailed lizard. Starting off at full speed, with his black banded tail held in air "as if afraid to let it touch the hot earth," he scoots across the sand as if "shot from a cannon." None of our desert lizards can move so fast nor can any run so far without fatigue. To arouse one of these "sand-lappers" from his seeming lethargy while at rest, and get him going at full speed in front of you, is an act always hugely productive of pleasure. Generally they move in great circles, but when on long, open stretches, where there is scarcely trace of vegetation behind which to hide, they run a straight course. Then it is that you see them racing at their best. Some observers have ventured to assert that these swift runners when excited will, in their anxiety for

speed, rear their bodies upright and proceed on their hind limbs like bipeds. When I was telling this to Loco Tom at Stovepipe Springs, he matched it with this yet greater absurd statement: "Why, up here these lizards run so fast on hot days that they have to stop every once in a while, turn over on their backs, and put their feet up in the air to cool them off in the wind."

It has always been a puzzle to me to explain how these swift-moving creatures can so easily find a hole for refuge while in movement. When going at top speed they can "spot" a burrow and suddenly duck into it as if they had known it was there all the while. Such is their momentum that you cannot see how by any possible means they can keep from shooting straight over the abrupt hollow.

When at rest their heads and shoulders are held up high in such a position as to favor careful observation and alertness. The pelvis and the tail rest flat upon the ground. The knees of the rear legs stand out at right angles from the body and are "elevated to such a degree that they nearly reach the plane of the back." This

position makes it possible for them to spring into action at a moment's notice. When ready to run, the whole body is well elevated, the tail flung up over the back, and away they go — mere streaks of white on the silver sand.

While on the Ralston Desert of Nevada I saw a male and a female making most peculiar and striking flirtations to one another, the two waltzing back and forth before each other in amorous antics much as mocking-birds are wont to do during the mating season. Until I came almost upon them they seemed so enwrapped in their wooings and waltzings that they did not notice my approach in the least. The movements were exceedingly graceful and full of weird rhythm.

These lizards are carnivores of a big appetite, and all sorts of tiny creatures, from insects to reptiles, fall victims to their voracity. It is common enough practice for them to turn cannibals and eat their own offspring — rather despicable business, this eating of one's own children, but possibly considered good form in reptiledom. We are glad to learn that at least a part of their food is of a vegetable nature —

sometimes half their sustenance comes from buds and foliage.

The gridiron-tailed lizard has received its common name because of the broad black bands found on the underside of the tail, which are so conspicuous when this appendage is reared in flight. This interesting lizard is found quite uniformly distributed over the sandy plains and gravelly washes of both the Colorado and the Mohave Deserts of California; also in western Nevada and southern Utah, where it is one of the most abundant lizards of the region. During winter it is dormant.

SAUROMALUS, THE CHUCKWALLA



SAUROMALUS, THE CHUCKWALLA

(*Sauromalus ater*)

THIS morning "old man chuckwalla" came out of his winter hiding looking as wrinkled and shriveled as a withered apple. His black beady skin hung on him in folds like the hide of an old elephant, and, as he clumsily clambered upon a big flat red rock and blinked his sleepy eyes in the sun, he appeared to have emerged from his winter torpor with only woe as his portion and without a sign to show that he could appreciate the new awakening spirit of spring. The brown-shouldered lizards had been sporting about playing tag with one another in the sun for over a month or more, the rock wrens had been making love flirtations for a fortnight. Even a few hairy caterpillars had ventured forth to feed days ago, risking being gobbled up by the voracious black-throated sparrows. The chuckwalla comes forth among the most belated of all the season's guests.

But wait — there is good reason for his tardiness. He, you must remember, is a feeder on

tender buds and blossoms, and why should he come to the feast before it is set? Many of the lizards can live on insects, but he must wait until the flowers have unfurled, and this is usually somewhat advanced in the season's cycle. The *elixir vitæ* that brings rejuvenescence to the wrinkled body is found in the petals of the flowers that come with the suns of March. To arrive before would be to come to an empty table. Homely, clumsy, stolid, unfinished-looking, and awkward of limb, yet he is the daintiest of feeders — and behind those sleepy eyes lies wisdom.

Not to mention the Gila Monster, the chuckwalla is our largest iguanid lizard, a full-grown individual attaining a length of eighteen inches. The general coloration of the body is brownish black or gray with darker cross-bars, these latter being most clearly defined in young specimens. The blunt tail is usually mottled or marbled with white. In rare instances it is entirely white. "It is a curious fact, however," says Dr. Merriam, "that the distinctness — or even the presence or absence — of these cross-bars, especially on the tail, is changeable in the

same individual, and apparently dependent on the intensity of light to which the animal is exposed."

Every part of the body is built for a purpose. Though it appears queer in form, yet a study of it will reveal that the chuckwalla is encumbered with none of those useless and over-exaggerated specialized structures which have so often marked senescence among reptiles. The clumsy, fat, blunt tail is his chief weapon of defense, and he can flop it vigorously when occasion demands that he use it. The smart blows he gives cause all his enemies to take notice of him. He looks lazy and stupid, but approach him and see how quickly his short, stubby limbs enable him to drop out of sight and into a place of safety. The flat body makes it possible for him to squeeze himself into extremely narrow cracks in the rocks, and because of his loose, elastic skin he is able to inflate himself so tightly that not the strongest man can pull him out from his place of safety. Rather will he surrender his tail to Cerberus than give up his body to his enemy. The lizard-eating Indians, the Shoshones, Cahuillas, and their near cousins the

Piutes, however, got the better of him; for they were accustomed to carry with them a sharp-pointed, hooked stick, and when they saw a chuckwalla which they wanted for food they punctured his inflated hide, and, against his will, pulled him out of his retreat.

The Indians prepared chuckwallas for eating by roasting them over a bed of coals. There is no reason to believe that the white flesh is not palatable.

Chuckwallas are rupestrine lizards generally living around dark rocks, such as iron-stained granites or lavas. They are frequent in almost all the lower desert ranges from southwestern Utah and southern Nevada westward to the Death Valley region and southward to Lower California.

Much of interest concerning the life-history of this remarkable lizard awaits some patient observer who will watch chuckwallas, not in a cage, but in their native home. Who will tell us the age they attain? Where do they lay their eggs? What are their breeding habits?

THE SIDEWINDER

THE SIDEWINDER

(*Crotalus cerastes*)

HE is the most vicious in appearance, most unusual in habit, and most feared by man of all the reptiles of the desert. He is so tiny that he seems made for a plaything, yet there is no man who is not ready to reckon him a beast of proportions when the measure of horribleness is applied and not the rule of girth or length. His hand is against every creature: he is no falsifier: he carries no mark of innocent countenance to bespeak friendliness where none exists. The green glares of cruelty are in his eyes and the hornlike scales above them give him the malignant aspect that befits his splenetic and ugly temper. His actions are quick, his aim is sure, and demonlike he prowls about in the darkness of night, by day lurking beneath bushes where his enemies cannot see him, but where he can strike the passer-by to advantage. This is the sidewinder — pygmy rattlesnake of the desert sands.

The outstanding feature of uniqueness which readily separates this from all other rattlesnakes, and which gives to the sidewinder his vernacular name, is his peculiar mode of progression. Instead of moving forward in the manner of ordinary snakes, he moves away sidewise, keeping in the meantime his broadside always toward the observer — a motion which is especially advantageous in carrying him over the sands. It is a somewhat looping movement and the tracks which are left in the sands are peculiarly different from those of all other rattlesnakes, being not continuous, but disjointed, and resembling a series of colonial *ss*'s, each separated by a space of three or four inches. Sidewinders apparently have a special fondness for crawling along in wagon tracks, and it is here where I have most often noticed the peculiar marks.

All other rattlesnakes must coil at least to some extent before they strike, but this erratic snake strikes "on the run," securing leverage for his head by arching the neck, after the fashion of a swan. This gives him an unmeasurable advantage over his other crotaline cousins and



THE SIDEWINDER, OR HORNED RATTLESNAKE



THE PALLID RATTLER (*Crotalus mitchellii*)

heightens greatly his danger to man; for he is always ready to attack the moment he is approached.

The average length of an adult sidewinder is about fifteen inches. His girth is about equal to that of a man's middle finger but may be greater if food has recently been taken. The dorsal ground color of white and the bands of brownish on his body give him a high degree of protection on the gray granitic sands on which Nature intended he should live.

As briefly stated before, sidewinders are almost wholly a night-roving species, doing most of their hunting under cover of darkness — the time when the kangaroo rats and wild mice, their chief fare, are most active and most plentifully found. During the day, especially in summer, they generally seek the shelter of rock crevices or hide under bushes where they can avoid the fierce heat. To expose themselves long to the sun on a desert day, when it is hot enough to cook eggs in the sand, would be to invite death. Five to ten minutes' exposure on the superheated sand in the glaring sun rays of midsummer is sufficient to kill. Generally,

when found during the day, they are seen wound tightly about the bases of shrubs or tightly coiled up in a compact little mat or pad in the shade. If able to find some slight depression, they curl up in that, quite often utilizing the hoofmarks made by cattle. These their coiled forms just about fit.

As soon as the sun goes down, they begin to wander abroad upon the warm sands. Walking along the railroad tracks at this time of day I have often found them stretched along the flange of the hot rails absorbing the heat from the fast radiating steel. Because of the sidewinder's nocturnal habits I have never fancied desert travel by night in summer, especially when afoot. All experienced desert travelers feel much the same as I do in so far as I can learn. The rattle of this snake is small and seldom used, and there is nothing to warn one of its presence. The great Mammoth Wash at its southeastern end of the Salton Sink is a place where sidewinders are especially abundant, and it has a most evil reputation even among the oldest "desert rats," as the veteran prospectors are called. They avoid traveling

across it at night in summer whenever possible, and if it is absolutely necessary to go over it they all resolve in most solemn terms "to go straight through and not stop to camp once." Who enjoys a rattlesnake crawling over one's covers at night?

One evening in late May, while a friend and myself were sitting on a rock quietly munching a crust, I espied a moving object near one of our bed-rolls. Watching it more closely I noticed that it was a small serpent crawling into the blankets. Realizing that it might be a dangerous reptile, I took a near-by stick in my hand and went up and carefully unrolled the bedding. As I had suspected, there lay a little sidewinder. I do not like to think of what might have happened had my eyes not detected in the semi-darkness the snake moving into his hiding. I cannot too strongly urge my readers when camping on the desert in late spring and summer always to make up their beds anew each evening just before retiring; for not only rattlesnakes, but such other unpleasant visitors as centipedes, vinegaroons, and scorpions may have found a hiding-place between the covers

since last they were used. Furthermore, I think it shows good judgment to sleep off the ground on a cot swinging from a tree if possible, as soon as the warm nights begin. There is no use taking chances.

There is abroad a colossally absurd notion that rattlesnakes are always found in pairs, and that if you kill one the other will soon seek its mate. It is quite possible that during the spring months, that is, the mating season, they may occasionally be found near to one another, but this pairing is only temporary and during the remainder of the year individuals wander solitarily.

All rattlesnakes are ovoviviparous; that is, they hatch their eggs before they are laid. The egg, with its yolk, white, and thin, flexible, membraneous shell, is formed within the oviduct of the female, but it never leaves the body. Hence the young are born alive.

Crotalus cerastes, the horned rattlesnake, or sidewinder, is the most characteristic snake of the Lower Sonoran Desert areas of the Great Basin — southeastern California to southern Nevada, southwestern Utah and Arizona. In

general it confines itself to the sandy and gravelly expanses, leaving the higher and more rocky desert mountain regions to be occupied by the tiger and the pallid rattlesnake.

TESTUDO, THE DESERT TORTOISE

TESTUDO, THE DESERT TORTOISE

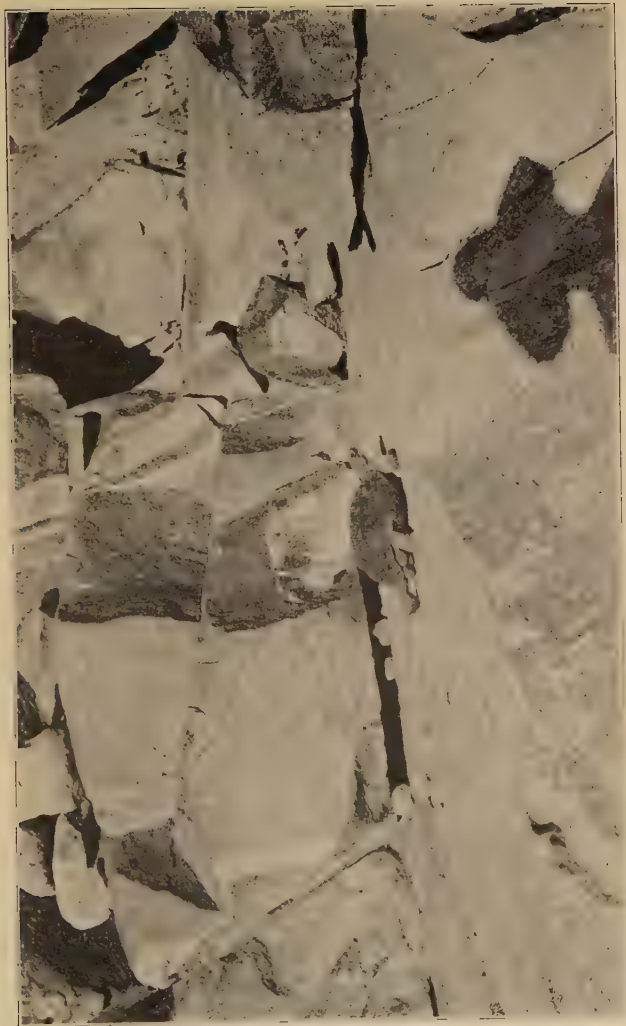
(*Gopherus agassizii*)

IT is interesting to imagine the frame of mind of those early Western travelers who, wholly ignorant of the existence of dry-land tortoises, espied for the first time these queer turtle-like creatures shuffling clumsily across their trail. We can almost see them "glowing" like old Tam, himself, "amazed and curious," and rubbing their eyes twice, then once again, to make themselves sure that tortoises in a desert wilderness are things of reality and not the apparitions of a dream. To their minds tortoises must have always been reptiles closely associated with water, and to find them here in the arid deserts far away from even a suggestion of dampness must have seemed a most extraordinary sight if not an anomaly. When their travels had carried them well within the range of this remarkable chelonian, these immigrants must soon have seen a sufficient number of them to feel assured that the first ones they saw were

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neither luckless strays from some water-hole nor wayfaring turtles homeward bound to the ocean after a race with the desert hares; for in those days Agassiz tortoises were plentiful all over both the Colorado and Mohave Deserts and in southern Nevada.

Generally these tortoises are found on the flat plots of ground of the high rocky mesas where a fair abundance of succulent, growing herbs assures them of an abundant food supply, at least during the spring season. During April and May, when both days and nights are balmy and warm, they are out feeding at all hours. Often when traveling at night I have seen them by aid of the brilliant moonlight. As soon as the real blistering days of summer come, not a tortoise can be seen by day. No animals except a few of the insects and lizards can stand the intense heat radiated then from the glaring rocks and sands and soda flats. At a point near Amboy on the Mohave Desert the temperature has been known to be as high as 136° F. in the shade at midday, falling to only 114° F. by two o'clock the morning following. A special thermometer placed in the open sun recorded a



A DESERT TORTOISE WHICH HAS JUST CRAWLED FROM ITS WINTER-HIDING BETWEEN
THE ROCKS

THIS SPECIMEN IS FULLY FIFTEEN INCHES ACROSS

temperature of 249° F. To be out under such conditions is literally to be cooked alive. The tortoises are wise enough to be under the rocks and bushes then and to confine their feeding to the night hours. Sometimes in summer they pass into a state of dormancy and do not eat at all.

In late October and early November, when the nights begin to get snappy, they begin to "hole up," as the desert people say, seeking the shelter of the ground for the winter's sleep. Tortoises found in winter are numb and seemingly lifeless. Strange it is, but they do not then have their heads drawn in under the carapace for protection. The eyes are closed, and nothing but heat will arouse them.

Desert tortoises, like turtles, are always slow of foot, and when approached they seem to know immediately that the best thing to do is to stop abruptly and draw in their heads and feet. In this latter act they are remarkably and almost ridiculously quick — so quick, indeed, that they give no creature the least chance to injure them. As the head is drawn in, they forcibly eject through their tiny nostrils the air from their lungs and so produce a rather alarm-

ing hiss. Securely encased in their shells, like non-resisting Quakers they wait in quietness and find safety in passive resistance.

To the Piute and Shoshone Indians inhabiting the Great Basin the economic importance of this dry-land "turtle" was considerable. These native people, who knew no natural repugnance to the use of lizards and snakes as food, used tortoises freely, as the great numbers of "shells" found around their old campoodies show.

To-day many of them are caught by the whites and cooked up into soups and stews, and one may occasionally find the savory meat offered on the tables of small-town restaurants of the desert.

In so far as I can learn these remarkable chelonians have, besides man, few enemies. The foolish coyotes, hunger-bent, sometimes make dolts of themselves by attempting to get inside the shell. Many a tortoise bears on his shell the toothmark-record of an encounter with these wild dogs of the deserts. I am not quite so sure but that a coyote might make a wretched meal off a soft-shelled baby tortoise,

swallowing it half-chewed like an oyster, but as to getting a feast out of one of the hard-carapaced adults, I am more doubtful. It seems he might as well chew rocks. We can well fancy the chuckling sense of pleasure the tortoise, knowing his safety, has when he finds himself rolled over and over and pawed about by the foolish dog simpleton, or feels the long sharp-fanged canine jaws harmlessly biting, but never making more than a mere impression on the hard-shelled armament. We can with imagination's aid see the outwitted coyote finally leaving the tortoise in disgust and yowling in similar vein to the foolish fox who unsuccessfully attempted to rob the vineyard, "Oh, I never did like tortoise meat, anyway."

But though the chelonian has been unharmed by the coyote's jaws, woe may yet overtake him if by some unhappy chance the coyote on departing should have left him lying flat on his back on some perfectly barren level spot: his end must now be death through starvation and exposure. The shell of his back is so high-domed that, struggle as he may, he cannot get his clumsy feet to the ground to turn himself

over. Had he been so fortunate as to have been turned upside down on some place where tall grass or tufted herbs were growing, there might have been a chance for him. An extra long stretch and twist of the neck and a bit of tortuous struggling with the elephant-like rear feet would under these circumstances have put him over.

How does *Gopherus*¹ get his water? Watch him in the early morning after a rain when there are droplets of water or dew on the herbs, and you will see him nosing up to them and catching the dangling water pearls in his horny beak. However, like his fabled racing competitor, the hare, he gets most of his moisture from the herbage he eats.

It is always a matter of speculation when we attempt to give the age of an adult specimen. A tortoise grows so slowly that it is almost impossible to see any change in size in any single year. The largest ones measure fifteen inches or more across and are doubtless very old. How many times have I wished, as I have seen these venerable creatures gazing up at

¹ *Gopherus* is the generic name for the tortoise.

me from out their brown-irised eyes, that the dumb mouth could speak and tell me of the things that have come to pass during their lifetime in their big wilderness world.

Tortoises make excellent pets. Give them but an out-of-the-way corner of your lawn and they will stay with you for years, content on such humble fare as lettuce and Bermuda grass and asking nothing of you but the sufferance to live. And why should we not learn something from these little dumb brothers of ours? Nature has withheld from them the gift of expression, but they may speak to us just the same, teaching us simplicity, humility, and gentleness.

There is a certain nobility of form and demeanor about these beautiful chelonians that has always appealed to me, and it is always with a sense of sorrow that I see them carried off and piteously slaughtered. Several times I have seen them piled by dozens in great crates and ruthlessly taken to the city markets, there to be butchered to satisfy the gormandizing epicures who can afford and will pay such fancy prices as this meat brings. Like lobsters the

poor things are thrust into boiling water (sometimes in cold water and then brought to a boil) — a practice which must elicit the sympathy of any one who has any sense of pity for God's sentient creatures.

THE VINEGARON

THE VINEGARROON

"MATA VENADO! mata venado!" ¹ screamed a Mexican laborer as he hastily jumped up from his seat by the camp-fire. Judging from his excitement I might have expected to see some reptile as big as a rattlesnake crawling out from the place where he sat. "Mata venado! mata venado!" he hysterically cried again as he pointed down with quivering finger to a queer, tan-colored spiderlike creature that ran swiftly off his sleeve and almost into the fire.

"It is only a harmless vinegaroon," I said. "He cannot hurt you."

But the poor man was so frightened he could not be quieted, and all my explanations did not avail to get him to sit down with us again.

"Did he bite you, señor?" I asked.

"No! No! But he might, and if he did I would die. That is what happens to all who are bitten.

¹ Spanish name locally applied to the vinegaroon; literally, *kill deer*. The common name is a misapplication of a name generally given to a Mexican species of whip scorpion which emits, when alarmed, a vinegar-like odor.

Why, if a mule even drinks water from a trough in which a vinegaroon has died, he will die too."

While not all Mexicans hold the vinegaroon in such dread as did this man, yet there are great numbers of them who feel just as he felt about them. It is an old superstition that cannot be uprooted.

I must admit that there is something uncanny and strange-looking about these queer animals with their four enormous, sharp-pointed, protruding jaws, and it is not strange that the ignorant are afraid of them. They run around so bewilderingly fast and in such helter-skelter fashion that you can never be just sure when they are going to crawl all over you. Small wonder that they are called "wind-scorpions" sometimes!

During the day the solpugids, as these creatures are technically known, hide in crevices in wood and under stones, and too often we find them seeking refuge in the folds of the camp blankets or in the pack boxes. At night they come out, run about, and, while very actively darting here and there, pounce upon insects and suck them for their blood. The population

of an ant community is often called upon to offer up a great number of individuals to satisfy the appetite of these greedy pugnacious monsters. Vinegaroons, that can get into wire fly traps and are willing to remain in the "prison perilous," kill a great number of flies and on such a diet grow very fat and monstrously large.

The solpugids do not depend upon the aid of any poison in bringing their captured prey into submission as do the spiders. According to Comstock, no poison glands are found and the bite, outside of its mechanical effect, is harmless.

These creatures seem to occupy an intermediate position between scorpions and spiders, but show in their anatomical structure a radical departure from the structure of either of these. The head and thorax are fused in one, and the first pair of legs is joined to the head—a most unusual position. The pedipalps (the second pair of appendages lying on either side of the mouth and which in scorpions serve as pincers) are as long as the true legs and like them are used as organs of locomotion. Through

this adaptation a solpugid has use of five pairs of walking appendages instead of four as does a spider. A spider breathes by means of book lungs, but a solpugid takes in its air through tracheal tubes after the manner of insects.



THE DESERT HORNED LIZARD

THE DESERT HORNED LIZARD

(*Phrynosoma platyrhinos*)

ALL those who have walked abroad on the desert at all observantly must have met that little lizard of the sands which has achieved its fame under the name of the horned toad. Because of its wide departure from the unprepossessing snakelike form of many of its reptilian congeners, and because of its unique and interesting habits, it has doubtless earned the good will of man more than any of our lizards. I have yet to find among the roughest miners and frontiersmen one who would purposely harm one; they always speak of them fondly.

Near Coyote Holes the writer found a veteran prospector named Johnson who had four horned lizards about his shanty and he seemed to think almost as much of them as he did his faithful burros. It was almost pathetic and at the same time pleasing to note what care he bestowed upon them. He fed them almost daily a meal of flies and talked to them as to

children. There was seemingly even in the hearts of those dumb creatures some feeling of gratitude and fellowship. They apparently knew their friend, and, when they heard him walking about with his heavy hobnailed boots on the rough board floor, they would shuffle out on the step and bask there in the sunshine until their beneficent keeper threw down some meal worms or flies and talked to them. They would lick up the flies and worms with their viscid tongues and feed until full when they would waddle away to "sleep it off."

The "horned toad" is totally different in appearance from any of our other lizards. The body is unusually flattened, and he carries on his head those enormous horns which are "without precedent among his modern kith and kin."

"Any one who has seen a horned lizard on the defensive," writes Dr. Harold Bryant, "cannot doubt the value of these horns as a protection to the animal. With its head lowered so as to receive any blow on the horns and the large scales of the back elevated, it presents a very formidable appearance."

So perfectly does the horned lizard's light

color blend with the gravel and sand that it is almost impossible to see him when he is quiet. Time after time when walking on the dunes I have almost stepped upon horned lizards, and would have crushed them under foot had they not shambled off and through their motion apprised me of their presence.

A detailed examination of the body brings to light several other peculiar adaptations to a life on the sands.

In many individuals the ear drum is almost wholly concealed by a scaly membrane, a peculiarity found only among desert species. The ear is often further protected by folds in the scaly skin of the short neck. Just beneath the outer horny skin covering are numerous pigment cells, each with its yellow pigment granule or chromatophore. These highly developed color bodies are under the direct control of the nervous system and the animal is able to make color adjustments with a fair rapidity, so that if its wanderings carry it onto darker or lighter soils it is capable of bringing about a color coat suitable to its environment.

Mr. Leonhard Stejneger, who made the report

on the reptiles collected on the Death Valley Expedition (1893), found that the horned toads which lived on the intensely white alkali soil around Ash Meadows in the Amargosa Desert were much lighter in color than usual. Other specimens taken elsewhere showed great variation in color ranging "from a very pale, in some nearly whitish drab-gray, to a vivid brick red."

The bony, rigidly built head is short and triangular in shape adapting it admirably as a tool for burrowing into the sand. When a horned lizard desires to cover himself for the night, he forces his wedge-shaped head into the sand just like a chisel, driving it forward by means of the legs. To facilitate the movement the whole body is wriggled back and forth. The last act in the burying procedure is a flip of the tail which covers the last visible appendage. It is surprising in what a short time the animal is completely hidden.

Horned lizards exhibit a marked preference for the sandy washes and are never known to occur on the rocky hillside. The reason for this is obvious, it being absolutely necessary for them to have loose sand in which to make their

shelter for the nights and cool days. They are active only during the heat of the day, generally confining their activities to the midday hours, but even with them there is a limit to the amount of heat they can stand. During the hottest part of the summer season they seek the shade or go under the sand during the hours of highest temperature and do their feeding during the late afternoon. The least cool weather sends them underground. Their hibernating season begins early in November and continues until about the first of March.

Dr. Bryant, who has made a special study of these reptiles, has accumulated abundant evidence to show that these scaly animals are exemplary destroyers of insects. Left to their own devices they destroy an amazing number of ants, noxious beetles, and flies. "Unless very hungry," writes Dr. Bryant, "live insects alone satisfy a *Phrynosoma*. In fact, their eyes seem unable to distinguish an insect unless it moves, so that this may largely govern the feeding habit. On seeing its prey, a *Phrynosoma* has a habit of raising and lowering itself on its front legs much as a lizard does when sunning

itself on a rock. Always when feeding it raises itself well on its legs seemingly to avoid being bitten. The moment the insect moves, the horned lizard darts for it, catches it on the end of its viscid tongue, swallows it alive, and backs off again. Why this animal is never bothered by being stung internally by the ants it eats seems hard to explain. Certainly the mouth and stomach must be particularly adapted to withstand the poisonous sting of insects, for when stung externally the lizard shows no little discomfiture."

Sand, dirt, and even small pebbles are often found in the stomach. These are probably taken in the act of swallowing the prey. I have found nematodes (parasitic round-worms) in several stomachs I have personally examined.

It is believed that the road-runner and the rattlesnake are his two worst enemies. Against such an enemy as the road-runner, whose keen eye is ever on the alert to discover fresh sources of food to appease his enormous appetite, the slow-moving horned lizard is practically defenseless. If he is close to a hole or bush, or if he taxes his wits to the limit, he may try to

escape by burying himself in the soil, but his chances for escape are exceedingly slim.

The tradition found among the Indians to the effect that a horned lizard is able to burrow its way out of a rattlesnake's stomach seems to have some foundation in fact. "Rattlesnakes have been found," writes Dr. Bryant, "with the head of a horned lizard protruding through the body wall. Rattlesnakes have also been found with the horns of a *Phrynosoma* caught in the throat."

Several young are borne at a time, each a minute edition of its parents. They all have their trial at life, but because of the many enemies a great number never reach the adult state. As soon as the spring well opens up, they are very much in evidence in almost every wash or dune area. When first borne they are so tiny that it would seem that they were utterly incapable of taking care of themselves, but the great number of adults to be seen at any time is evidence enough that they are very well able to provide themselves with both food and shelter.

Horned toads in moulting shed, not the entire

skin at once as snakes do, but scale off gradually. Since the skin consists of continuous layers, it loosens in patches of various sizes and either drops of its own accord or is rubbed off by the animal's ordinary movements. The cartilaginous caps covering the horns are shed in one piece.

The desert horned lizard inhabits all the hot arid low-plain environments of the Great Basin and Salton Sink, occurring as far east as western Utah. In the extreme southwestern limits of its range it is associated with the flat-tailed horned lizard (*Anota macalli* Hallowell). The horned toad of the Pacific Slope is a distinct species.

SPILOGALE, THE SPOTTED SKUNK

SPILOGALE, THE SPOTTED SKUNK

(*Spilogale phenax*)

THE spotted skunk is an industrious, quick-witted, brave little animal. Few men give the credit that is due her for her good behavior under trying circumstances, her quiet affection and general inoffensiveness. A little spotted skunk has lived under my house now these three years, and in all this time she has behaved herself as a perfect little lady, and has, so far as I know, lived on good terms with all my animal friends. She makes her evening calls about the premises without sound or odor and assists in work by picking up crumbs in the yard and keeping the place comparatively free from insects.

Skunks have their effective means of defense — they realize its efficacy and use it when severely provoked; but they realize also that the fetid oils cannot be produced in unlimited quantities, and so on the whole they are pretty careful to emit unpleasant odors only when

driven to it by necessity. This is especially true of the little spotted skunks. For this reason they often live in peace with man, while the big striped fellows are hunted down and shot.

Only once in all my out-of-door experience have I come into unpleasant relations with the spotted skunk, and this was under such circumstances that I felt the little creature was fully justified in her acts. I had been sleeping for some nights on a cot in a little sandy wash on the banks of which was a thick mass of grasses. Several times I had been awakened by a skunk which was jumping about in the grass catching the mischief-making mice. These small rodents she caught by springing upon them and then holding them with her forepaws until she could kill them with her sharp teeth. On this particular occasion the little mouse had in some way the advantage, and, squirming around, bit first, causing the skunk to give a squeaky scream and unwittingly to make life quite unbearable in her presence. I had read in natural histories that the odor of a skunk could produce unconsciousness. I can vouch now for the truth of the statement. The odoriferous,

ethereal oil was shot into the grass immediately beside my head, and the odor was so strong that I was overcome and at least for several minutes was quite unaware of all that happened around me. As I came to my full consciousness, I found my eyes smarting and my nostrils inflamed. Had I been so unfortunate as to have been in the direct path of discharge I might have fared badly. Persons who have been hit directly in the eye have been known to lose their sight.

The odor of the spotted skunk is not very lasting in dry, sunshiny weather, and after I burned off the grass next morning I found all traces of the foulsome scent gone. The odor of the striped skunk is much more nearly permanent. Back of my camp on the Colorado Desert I have a beautiful tussock of squaw grass (*Epicampes rigens*) much resembling, though much smaller, the pampas grass of Argentine. On several occasions I had noticed that there was a beaten circular path beneath it, but who the pathmakers were I did not know. One night I heard something playing under my cot, and, stretching my head over the side, I saw by the aid of the moonlight a couple of playful skunks.

They paid no attention to my intrusion, but went on playing like two kittens. But when I turned over in bed and made the springs squeak and snap, they shot out from under that cot in a hurry and made for the grass tussock. As they went under, they were joined by a third frolicsome companion whose presence I had not suspected, and the three now began a playful, hilarious, spirited skurrying and whisking about under the grass on that half-concealed race-track. This was so ludicrous and ridiculous in its manner that I laughed aloud. Around and around they went, faster and faster, faster and faster, like boys playing tag, until suddenly one of the skunks, possessed of some strange new thought, shot off the grass-sheltered track at a tangent, only to be followed by the others, into the cat's-claw bushes and up the hill. Now I understood the origin of that mysterious grass tunnel and judged by its well-worn appearance that it served as a place of frequent frolics.

The playfulness of the spotted skunk is well known to all who have observed it much. "I never yet," said an old prospector, "saw a little phobie skunk [the Western spotted skunk

is often referred to by cowboys and prospectors as the "hydrophobia" or "phobie skunk"] what would n't play with you if it just had a good chance. They get tame just like a kitten, and it's no time until they're crawlin' all over you trying to make you play with 'em. Onc't I had a little cabin made of palm logs and it was n't very extra built, so that it had a number of cracks in it. Now it beats all how them little phobie cats can get through a crack. I had n't been sleeping inside many nights until I had a visit from a skunk. She came through a crack in the back end of the house every night after that at just about dark. I got to feedin' her bacon scraps, and the first thing I knew she was lettin' me pat her a bit and stroke her soft hair. She used to like to crawl upon my head and down on my shoulder — and then jump, she would, square into my lap, and then race up my arm to the top of my head again. A feller's hair gets powerful long a-stayin' out in the desert with no barbers around, and that little skunk used to like to come in when I was layin' down on my bed and then play with my locks. And when she had a batch of little kittens,

was n't she proud of them! She brought 'em into the house there and showed 'em off to me like the proudest mother you ever saw. And the old mother skunk and the kittens used to play around and purr and I'd give 'em stuff to eat, and we just had a great time of it, them skunks and I. It took all the loneliness out of me, and I never will fergit 'em. Never a mouse did I have around the place so long as they was there. Better'n old cats, they are, to catch mice any time."

My friend, Dr. J. H. Kocher, recently told me of an experience in the open that further corroborates the prospector's opinion of the playful nature of skunks.

"Carl Eytel and I were camping out near the Keyes Ranch in the mountains bordering the Colorado Desert on the north," said the doctor. "The sky was overcast all the afternoon, and toward evening it began to drizzle a little, so that we were concerned about shelter. As luck would have it some trappers who were camping in the vicinity asked us to spend the night in an extra tent they had near their camp and which they were not using. There were lots of things

piled up on the floor in a sort of hit-and-miss fashion, and a lot of dry pelts were hanging on a wire strung lengthwise beneath the ridgepole, but we managed to find room to open up the two spring cots which were offered us. Mr. Eytel found a place at one side of the tent, but the only place for me was in the center just beneath the skins. But I did n't mind that; they were dry and odorless and hung at least six or eight inches above my head.

"Late in the night I was awakened by feeling some animal of fair size crawling over my sleeping-bag. I could n't imagine what it was, but finally decided it might be a house cat belonging to the trappers. As best I could in my tight sleeping-bag I kicked about, hoping it would leave me before long, when presently I caught a little whiff of an odor that told me it was a skunk. I called to Carl, hoping he could tell me what to do to get rid of the animal. His only answer, given in a whisper, was: 'Better keep still.' So I did, and I am not ashamed to say that for once I stuck my head under the blankets. I was not going to risk my nose being bitten by a skunk.

“The skunk now began the most ludicrous set of contortions and dances, stamping and alternately pounding its feet on my breast and rattling and playing with those dry pelts above me. It would have been nothing but funny had it kept it up only a few minutes, but when a fellow has a skunk thumping his breast for a full half-hour it becomes not only monotonous, but positively nerve-racking. I again stirred underneath the cover hoping that the creature would move off, but the animal was so absorbed in its play with those dried pelts that it paid no attention to my movements at all, keeping up its demoniacal dance just the same. Unable to bear the strain longer, I called to Carl to chase off the creature in some way, but again he only advised me to ‘lay low.’ But this was now impossible, and I called to the trappers for aid. Providentially they soon came with a lantern, and the skunk, alarmed by their presence, moved off, her beautiful tail hanging gracefully above her. Before morning she came into the tent again, but did not bother me. When I examined the skins next morning, not a single one was found to be injured or ruffled up in any

way. The skunk had had a bit of pure play."

I never eat bacon, but once in a while some of the boys who come to see me bring a piece along with them, and, when they go away, leave a bit for my animal friends. Once not long ago when they did this, the odors of the bacon soon drew my skunk, which lives under the house, out from her hole. She came about dusk, but, finding me in the house, desisted from entering just then. As soon as I went to bed, however, she wiggled through a big crack in the chimney and found the delectable meat. I heard her go in; the characteristic wooden-legged, waddling, shuffling gait was unmistakable. I immediately got up, went into the house, and lighted the lamp. There was my skunk on the shelf with the bacon which she was now industriously chewing, working her head from side to side, cat fashion, to get better hold with her sharp-pointed molars. As I approached within a foot of her with the lamp, she seemed dazed for a minute or two by the bright light. Her little round jet eyes shone with much luster as she looked at me. Skunks are afraid of quick movements, as most animals are, and so I moved

very slowly and she had no fear of me. Soon she resumed her eating, stopping once in a while to lick the grease off her chops and hands. A lad who was staying with me at the time was very eager to try picking the creature up by the tail and thus carrying her out of the house head down, having heard from woodsmen that there is no danger of a skunk discharging from its scent glands in this position. But I decided to take no chances; the skunk went on feeding and we to bed again.

For a while after that one or more skunks came every night. Sometimes when I went into the shanty to watch them they would retreat to a corner or hide in the closet, and watch me with their beady, black eyes from behind the curtain to see what I was up to. Once one hid in the closet all day. Thus far my furry neighbors had never caused any disagreeable odors in the house; yet I became uneasy lest on some occasion they might be provoked and scent up my quarters. Accordingly I nailed up all the knot-holes and stopped the cracks, and especially one small hole in the closet through which they most often entered.

Feeling that the house was now secure against all intruders, I went to bed outside at night with a mind at ease. About midnight, soon after, I was awakened by something crawling on my covering above me. It was moonlight, and when I peeked out I was surprised to find a little spotted skunk perched on my blankets. I rose up a foot and so tilted the surface of the covers that the animal slid off to the ground. But she almost immediately came back, this time crawling upon my shoulder, whence she tried to jump off onto the low-eaved roof of my house by which I was sleeping. In this attempt she failed, but did not give up until she tried twice again. Persistence is one of the virtues the skunk ever possesses.

The climax came that night when I awoke feeling the skunk's cold nose on my neck and realized that she was trying to crawl under the covers with me. This was undue familiarity for a night prowler, and I quickly drew my head under the covers and waited until my friend decamped to the other side of the house, as she soon did.

In her wanderings that night the skunk

finally spied out how to get up on the roof by climbing onto an out-of-door cupboard, and when next I saw her she was in the act of squeezing herself through an unclosed crack up under the eaves of the house, a place I hardly expected to find her. Her head, half her body, and front feet were well inside, and with the hind, long-soled paws she was scratching vigorously on the boards outside, trying, by ludicrously wiggling her body this way and that, to work herself inside the house. Her persistence was rewarded by her gaining entrance, and she got her meal of crumbs and apples as usual. Through the same opening she made her way out before morning. Had you examined the narrow passageway you could not possibly believe the animal could have got through it. But where there is a will there is a way, even in the mind of a skunk, and it is only too clever in finding it out.

THE END

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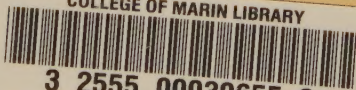
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